

COMPUTERWORLD

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Fly the friendly skies of
EUS? The systems integrator
reportedly wants to be
the first nonairline to run an
airline reservation system.
Page 6.

Mac-to-go weighs in as big hit

BY JAMES DAILY
CW STAFF

UNIVERSITY CITY, Calif. — It
was not hard to guess that Holly-
wood was right down the road.

With lasers, lights and smoke
bulbs working overtime, Apple
Computer, Inc. boozed off in
two directions at once last week
as it unveiled its long-awaited
Macintosh Portable and the
high-end Macintosh II.

The product introductions
are the most significant Apple
rollouts since the unveiling of the
Macintosh SE more than two
years ago and mark important
additions to the popular Macin-
tosh family.

In recent years, attractive
low-end DOS laptop computers
from companies such as NEC
Corp., Zenith Data Systems, To-
shiba Corp. and Compaq Com-
puter Corp. have left Macintosh
users howling for an equal. Apple
Chairman John Sculley admitted
that he wanted to deliver a laptop
a year ago, but problems pre-
venting the sophisticated screen
Continued on page 139

Insurers wary of image risk

BY MICHAEL
SULLIVAN-TRAINOR
CW STAFF

After running pilot projects that
predicted a 30% productivity
gain, Scott Kania, a Cigna Corp.
business executive, is going this
month with a \$2 million im-
age processing application.

Kania's project is expensive
as new systems go, but it re-
quires more than a monetary
risk. The application will dramati-
cally change the way 66 Cigna

AD/Cycle starts uphill climb

BY ROBERT MORAN
CW STAFF

Users and observers character-
ized IBM's AD/Cycle announce-
ment last week as long on strategy
and short on deliverables but
said they were relieved that the
wait for the repository will end in
June 1990.

In theory, AD/Cycle, IBM's
applications development strat-
egy for Systems Application Ar-
chitecture environments, pro-
vides a framework for users to
improve the productivity and
manageability of their applica-
tions development — a process that
has long been bogged down by
application backlog that ex-
ceeded five years at many large
sites.

The backlog of applications
has been growing faster than a
company's ability to automate,

according to Sam Albert, an in-
dependent consultant in Scars-
dale, N.Y. "Anything that IBM
can do to automate that process
will in turn reduce the applica-
tion development backlog for or-

Development cycle
Key components of IBM's AD/Cycle available during the next nine months

Product	Availability
Repository Manager/MVS	June '90
Query Management Facility	December '89
Interactive System Productivity Feature	Q1 '90
Cross System Product	June '90
CS/P 370 Runtime Services	June '90

* Generates VS Cobol II application programs for IBM environments

ganizations and result in industry
reviews," Albert said.

The applications life cycle
ranges from business modeling
and requirements analysis to

Continued on page 141

Open systems group wavers on AIX

BY AMY CORTESE
CW STAFF

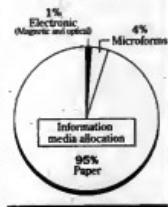
The status of IBM's AIX as the
basis for an industry-standard
Unix operating system may be in
trouble. With a month to go until its
first scheduled delivery of the

employees do their jobs, require
redeployment of key personnel and
raise questions about the benefits ad-
ministration processes.

But it is still a small-scale risk,
typical of image-processing ap-
plications in insurance. While they
benefit, they fail to provide a
Continued on page 14

Hold onto those erasers

Electronic media storage set by end users is relatively insignificant



OSF/1 operating system, the
Open Software Foundation is
contemplating reducing AIX's
role in the final product and
bringing in other software technol-
ogies.

OSF's choice of AIX as the
foundation for its Unix offering
was the topic of endless industry
debate last year, forcing the
group to defend AIX's "technical
superiority." However, sources
reported that OSF is aggressive

ly investigating the Mach oper-
ating system, developed at Car-
negie-Mellon University, to
provide functionality lacking in
AIX. An OSF spokeswoman con-
firmed last week that OSF is investi-
gating the Mach kernel, to poten-
tially integrate into the AIX
offering.

The spokeswoman conceded
that introducing new technology
Continued on page 6

What remains of Cullinet?

CA mum on reports of firings, slashed projects

BY NELL MARCOURIS
CW STAFF

WESTWOOD, Mass. — The re-
lationship of Computer Associates
International, Inc.'s acquisition of
Cullinet Software, Inc. set in last
week for customers wondering
what will be left of product sup-
port and for hundreds of employ-
ees left wondering where they
will next work.

CA decided to quantify the
numerous reductions in jobs that
began within hours of the official
closing of the takeover two
weeks ago and was wrapped up
last week.

Reports from several sources
close to Cullinet, however,
placed the figure in the 650 to

700 range. In addition, according
to the sources, an estimated
200 people — "a lot of them
in development" jobs — left the
company between the June an-
nouncement of the Computer
Associates buyout and the deal's
early September closing rather
than wait to let CA decide their
fate.

Meanwhile, the future of
some of Cullinet's most promis-
ing recent product offerings appears
far from certain. The official
CA white paper issued by the
new owner immediately after the
buyout implied that all Cul-
linet lines will be maintained and
supported, but layoff patterns
and unofficial reports that
Continued on page 12

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NEWS

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- 6 EDS has no reservations about buying Texas Air's System One.
- 8 HP LAN Manager/X edges Unix and DOS-based systems one step closer to unity.
- 10 Nynex management system jockeys for inside position against a couple of war-horses.
- 12 CA closes out Cullinet banking software development.
- 14 IBM PC users now have a mainline to the mainframe.
- 19 Not even computers can figure out hurricanes; forecasters still have to play some hunches.
- 20 Apple and Baxter join forces to create a new company with a healthy image.

Wizard of OS. A telephone poll of 175 large PC sites by International Data Corp. reveals some unflattering trends for OS/2. Speculation and uncertainty about the operating system prevail with very little ongoing third-party development work, while user familiarity with the software wanes. Plans to standardize on OS/2 somehow keep getting pushed deeper and deeper into the next decade, the report finds, with about one-third of those polled saying they'll never standardize on it. The only OS/2 applications making any hay in the marketplace are OS/2 versions of the old DOS applications. DOS extenders, anyone?

Quotable

"What I heard today is the biggest bunch of garbage and mumbo-jumbo I've ever heard in my life."

JOHN WARNOCK
ADOBEx

On Apple and Microsoft's move to establish an alternative page-description language to Postscript. See story page 6.

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Learning the business of business is a must for Cadbury Schweppes systems developers. Page 65.



JONCE RAYED



Too big, too small, or just right? Evaluating jobs for document imaging. Page 107.

EXECUTIVE BRIEFING

■ Computer imaging's bright potential is dulled by slow acceptance in the insurance industry, considered a prime candidate for the technology. The big problem is the lack of a demonstrable payback that management demands. As a result, imaging is largely in the pilot stage, and no insurer has yet made the move to it competitive advantage. **Page 1.** The cost justification for imaging won't necessarily come from paper reduction but from more flexible information handling. The more complex the application, the better imaging looks. **Page 107.**

■ IBM sketches an application development road map, announcing the long-awaited repository for use in modeling enterprises and how they use information. Users are relieved to finally get a look at IBM's plans, but they question whether AD/Cycle's environment goes far enough. **Page 1.** Another concern is the central role of IBM's Cross System Product as an SAA application generator. The new CSP sports a nice interface, but it's still a bit player in the market. **Page 140.**

■ Our annual Hardware Roundup: While the Intel 386 chip and EISA bus were making the papers in '89, the hidden story was the upheaval in the structure of the PC market. IBM, Compaq and Apple still rule the roost in the elite class of high-end systems, but IBM's market share is shrinking. The middle tier of the PC market has pretty much washed away, and a large commodity segment has emerged, dominated by Compaq. Price is the key factor in this market. Low-cost clone manufacturers are doing all they can to differentiate themselves to survive. **Page 69.**

Architectures, not products, are what users are looking for in the small systems market, and they're seeing triple: IBM, DEC and RISC. **Page 91.**

■ Don't talk tech when you're involved in a business review at the firm of Cadbury Schweppes. The company requires new IS employees to spend at least a couple of months immersing themselves in the business. Only after they understand how the firm operates can they suggest ways to apply computers to the process. **Page 65.**

■ Network servers may gain favor as serious application vehicles if a report commissioned by Microsoft and Ashton-Tate is correct. The independently audited benchmark says that the company's SQL Server is capable

of running transaction-class applications. **Page 35.**

■ Workstations reach the magic price point and begin to compete with PCs. As the first sub-\$4,000 Unix workstation hits the market, attracting user interest, many believe the critical mass of applications may soon follow. **Page 4.** Meanwhile, the Intel 386 chip is taking its lumps for some overblown early Intel performance claims. Observers now say that the chip is not CPU material and will probably live as a coprocessor. **Page 25.**

■ Computer Associates moves quickly to swallow Cullinet. Gore are most Cullinet executives, a banking software development project and about 850 employees. Left in limbo is Cullinet's successful Enterprise/Generator system. CA is expected to release a paper next week detailing plans for the absorbed Cullinet products. **Page 1.**

■ On-site this week: Expert systems are available round the clock to help Wendy's troubleshoot equipment problems. **Page 39.** The New York public school system pilot tests a database and computer network that will someday maintain central records on more than a million students. **Page 25.** "Brooks," can you spare a dime? Lacledes Gas goes with a cross between a bridge and a router to combine flexibility with low cost. **Page 53.**

WHOOS

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IS execs not quite in the front row

BY CLINTON WILDER
CW STAFF

NEW YORK — Although substantial progress has been made, information systems chiefs in most corporations still fall short of the executive suite of top management.

That was the consensus of IS executives and consultants at *Business Week's* second annual Symposium of Information Executives last week.

Walter Atkins, director of Technical Resources, a IS consulting practice, concluded the two-day executive to a rookie who has made a pro football team but is not a key member of the starting lineup.

"He's on the team without a

playbook," Atkins said. "The problem is that in most companies, the playbook is not written. It's a general understanding of 'the way we do things around here.'

Atkins noted that while other business disciplines such as marketing, accounting and engineering have been practiced for centuries and have developed established cultures, IS is only about 15 years old in less than 40 years old. Many companies have had difficulty according such a new discipline equal status with traditional departments.



Michael Alexander
PC & Workstations
Research Manager

However, the speakers from the IS executive community, many of whom are considered to have achieved that status in their companies, stressed that IS executives cannot wait for the invitation from senior management.

"Act like a business executive, not someone who's only in charge of IS but has an enterprise-wide view of the company," said Jim Freeman, senior vice-president of Cigna Corp.'s Cigna Systems unit. "You have to be able to go to your peers and not ask what you can do for them, but say there's

something you intend to do in IS and need their support."

Several executives said that IS executives have a huge role to play in helping their companies adapt their resources to the major demographic changes taking place in the work force. The demands for technical proficiency and so-called knowledge workers are increasing at the same time that the labor pool is shrinking and becoming increasingly foreign-born.

"We in IS need to help design the jobs that people will fill," said Malcolm MacKinnon, senior vice-president at Prudential Insurance Co., the nation's largest insurer. MacKinnon noted that when IS units develop into a firm's business units, it will ensure that there is a technical career path within that unit if the developer does not want to move to another function.

PC, workstation firms prepare for price war

BY MICHAEL ALEXANDER
CW STAFF

The makers of workstations and personal computers are headed for a shootout that promises to make the gunfight at the OK Corral look like a walk in the park.

The entry-level price of workstations has fallen dramatically this year to the point at which some models sell for less than similarly configured PCs.

Market leader Sun Microsystems, Inc. has not been able to keep up with demand for its lowest Specification 1, a Unix workstation offering 12.5 million instructions per second (MIPS) that was introduced in April, according to the company. The \$8,995 workstation packa-

workstation introduced two weeks ago by Hewlett-Packard Co. to Apollo Divisions.

At \$3,990, the entry-level 2500 is priced some \$700 to \$2,000 less and offers better performance than personal computers made by Apple Computer, Inc., and Compaq Computer Corp., said John Thompson, senior product manager for personal workstations at Apollo (see chart). It is also approximately two-thirds the price of an entry-level Sun 3/80 and nearly half the cost of a Digital Equipment Corp. Vaxstation 3100, 16 said.

The workstation, which runs at 4 MIPS, is aimed at customers who have wanted the processing power and networking capabilities of a workstation but previously were unable to pay the premium, Thompson said.

The market has reached its "magic price point," at which customers will begin to seriously consider workstations instead of personal computers, especially for use in distributed computing environments, said Michael Mil-

likin, vice-president at Seybold Office Computing in Boston.

"I think that trend is already beginning," Millikin said. "As you come down to the \$4,000 price, it is an acceptable entry point that will open a lot of doors."

So far, corporate customers have shied away from buying workstations instead of PCs, partly because PC software leaders Lotus Development Corp., Ashton-Tate Corp. and Microsoft Corp. have yet to introduce workstation equivalents of their best-selling software.

Unix needed

"As workstation prices come down, it will be important for independent software vendors to include a Unix platform in their development," said Andrew Allison, editor of the "RISC Management Newsletter," based in Los Altos, Calif. He predicted that PC power users will step up to workstations with the wider availability of Unix-metaphor software such as HP's New Wave for workstations.

The average price of a workstation has nose-dived at a rate of 20% per year, according to Dataquest, Inc.

The San Jose, Calif., market research firm said worldwide sales rocketed from about \$2.7 billion in 1987 to \$4.1 billion in 1988, a stunning annual growth rate of 52%.

CORRECTIONS

Andrew T. Eiseman was incorrectly listed as information systems executive at US West in the Sept. 11 *Computerworld Premier 100* selection. Winston J. Wade, a vice-president, is president of the company's Information Technology Group.

Information on Systemetics, Inc.'s Expert Release 5.5 software that was listed in the Software & Service section [CW, Sept. 11] was drawn from outdated literature and is not relevant to the company's current product line.

The limited free upgrade program for users of IBM's Advanced System/400 cited in "IBM rekindles AS/400 flame" [CW, Sept. 11] applies exclusively to customers who have an AS/400 Model 830 or 840 or Total System Package-equivalent Model P30 or P40 on order before Oct. 27 and installed between Sept. 5 and Dec. 29.

In the Product Spotlight chart on Digital Equipment Corp. maintenance providers [CW, Aug. 28], ABS Associates, Inc.'s telephone number should read (312) 577-7752.

In the Hardware Roundup medium-scale systems chart [CW, Sept. 18], Honeywell Bull should read Bell H. N. Information Systems, Inc., in the large and medium-scale systems chart. Prime Computer, Inc. provides end-user and value-added reseller distribution.

A rose by any other name...

The fine line of distinction between workstations and personal computers were blurred in the dust with HP's recent release of a new Apollo system.

Apollo (VX200)		Workstation	
16MHz processor	32MHz processor	16MHz processor	32MHz processor
68020 chip (3.3MHz)	No coprocessor	68020 chip (13.7MHz)	
15 in. monochrome monitor 128K by 870 pixel resolution	Monochrome monitor	15 in. monochrome monitor 640 by 870 pixel resolution	

—CHRISTIAN FRIEDL, PCW

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CRS may attract nonairlines

BY CLINTON WILDER

CW STAFF

Electronic Data Systems Corp. will be the first nonairline to own an airline reservation system if its reported negotiations to buy Texas Air Corp., a System One subsidiary come to fruition. But it may not be the last.

According to published reports last week, financially strapped Texas Air, parent of Continental Airlines and strike-crippled Eastern Airlines, is negotiating to sell the U.S.' third-largest computerized reservation system (CRS) to EDS.

Both companies refused to confirm the negotiations, but EDS spokesman Roger Still said his company is aggressively trying to expand its business travel processing for parent General Motors Corp.

Future's Fed?

Outside ownership of a CRS may be the wave of the future, said Jim Needham, national director of Ernst & Young's tourism and hospitality consulting practice in Seattle. Pending antitrust legislation sponsored by Sen. Howard Metzenbaum (D-Ohio) could require airlines to sell their CRSs or spin them off as independent units because Metzenbaum believes they give the owner an unfair competitive edge.

Meanwhile, the U.S. Department of Transportation launched a broad inquiry last week to determine whether regulations pertaining to airline CRSs should be strengthened to prevent abuses.

The proceeding was triggered by a series of complaints and petitions from the American Society of Travel Agents and Texas Air, which argued that various clauses in the five-year contracts between CRS vendors and travel agents are stifling competition.

"It could be a good strategic move for EDS," Needham said. "What they're really buying is the network, which could provide synergies to other segments of the tourism business."

EDS has deep pockets as well as a will to expand, said Stephen McClellan, computer services industry analyst at Merrill Lynch & Co.

"I would assume it's going to happen," he said. "They have several hundred million in cash to spend on acquisitions, and they know what they're doing in transaction processing. They can do the processing more efficiently and get more profitability out of it."

Users to reap benefits of Postscript

BY JEAN S. BOZMAN
AND CHARLES VON SIMSON
CW STAFF

SAN FRANCISCO — Users should not be concerned about the effects of last week's dramatic confrontation that pitted Apple Computer, Inc. and Microsoft Corp. against Adobe Systems, Inc., industry analysts said.

Apple and Microsoft have combined to develop their own page-description language, but Microsoft said its font standards

ing many of its specifications. The news came just a month before Adobe starts shipping its new ATM page-description series for the Apple Macintosh.

"If Adobe didn't open Postscript up now, someone else would have forced them to do it," said Herb Edelstein, a partner at Euclid Associates in Berkeley, Calif.

Until now, Adobe has been the unquestioned market leader in desktop publishing, capturing the lion's share of the market. Its fonts are used by most major computer hardware vendors, including IBM, Hewlett-Packard Co. and Apple Inc., by the biggest names in printing, including Compugraphic and Varityper.

However, some Postscript clones were already beginning to emerge as third-party firms elaborated on the published portions of the Postscript standard.

"Before this, we had no open standards. Now, we have two," said Charles Durrell, editor of the "Book & Rhodes" Report on Desktop Publishing.

Nick Donofrio, president of IBM's Advanced Workstations Division, declined to state his position on the Apple/Microsoft conflict with Adobe. "We are very much in support of Adobe Postscript," Donofrio said, noting

it will be compatible with Adobe's. Users may soon be able to pick and choose which they want. The forceful competitive blow to Adobe, which developed the Postscript page-description language, means that a new printing standard will emerge, analysts predicted.

Within hours of the announcement, Adobe Chief Executive Officer John Warnock parried the move, announcing that he would "open up" Postscript by publish-

AIX

FROM PAGE 1

at this late date would set back the planned rollout of the operating system, slated to start with the developer version in October. But she maintained that general availability, originally scheduled for July 1990, will still come in the "second half."

Last release

The disclosure comes amid growing speculation that IBM is having problems bringing its latest release of AIX to market as scheduled. IBM has indicated that it may announce new workstations running AIX in the first quarter of next year. However, the announcement was widely expected to come next month.

Another OSF official disclosed last week that a letter was being sent to members to inform them of the intention of Mach and to request feedback. A decision will likely be made at the next member meeting, to be held in early November, at which time the OSF staff will present a revised plan, he said.

The decision to look beyond

AIX is in response to feedback from members that certain functionality lacking in the product is desired in the 1990 time frame, such as full multiprocessing capability and high-level security, the OSF spokeswoman said.

Unlike most Unix variants, Mach was designed with multiprocessing in mind. Recent 3 of AIX, on the other hand, will have multiprocessing enabling capabilities but will not have the necessary code in that release, the OSF spokeswoman said.

Mach's inherent multiprocessor capabilities and clean design have captured the interest of many organizations in the Unix industry, including IBM, which has helped fund Carnegie-Mellon's research. The operating system was cast into the limelight earlier this year when Next, Inc. based its much-publicized workstation on it.

"Multiprocessing has become a principal requirement" for Unix, said James McDonald for the new version of AIX, said William Flagg, assistant manager for Personal Systems at IBM, last week. "Mach has always been on the horizon as a potential for that but was considered fairly immu-

ing that IBM makes extensive use of Postscript for output from both large and small systems. "It's a fundamental underpinning for that industry segment."

However, because IBM's OS/2, the new Apple/Microsoft standard will, by default, be on IBM machines.

Apple CEO John Sculley and Microsoft CEO Bill Gates kicked off of the dispute with an announcement Tuesday that they would make Apple's new Outline font technology and Microsoft's new printer software standard across Apple's Macintosh and Microsoft's OS/2 Presentation Manager platforms. The new Apple standard would, they said, be compatible with Adobe's Postscript.

"We chose to license Apple font technology because it was the best there was," Gates said.

By Wednesday morning, the Apple/Microsoft move led to visible anger on Warnock's part, who addressed the Seybold Conference Public Relations Center here, along with Gates. His voice cracking with emotion, Warnock told the Seybold gathering of 1,000 that the Apple standard would ruin his dreams of a single, global standard for printing. "What I heard today in

ture. The view is that that is changing, and Mach is becoming more realistic to integrate."

Flipp conceded that when Release 3 was licensed to OSF, it was expected to be completed earlier than is believed now;

the biggest bunch of garbage and mumbo-jumbo I've ever heard in my life," Warnock said. "Adobe Postscript is important to the publishing industry that I'm not going to let it fail."

Warnock asked for support in presenting Postscript to the international standards committee as a global standard. "The desktop publishing industry has been built by the people in this room. It certainly hasn't been built by Bill Gates," he said.

Steve Jobs, CEO of NeXT, Inc., was the first to defend the concept of a single page-description language. "This is trying to get more revenue for Microsoft. That's great," Jobs said, as Gates listened nearby. "But there's absolutely no new technology here."

The Apple/Microsoft move comes several months after Apple severed its long-standing relationship with Adobe and a month before Adobe plans to ship its Adobe Type Manager for the Macintosh.

"ATM was to be Adobe's pre-emptive countermove to the ability of Microsoft and Apple to do desktop publishing," said Paul Zaneveld, a senior analyst with The Yankee Group in Boston. With outline technology, he said, letters are generated mathematically, reducing the need for multiple font files describing different type sizes.

however, IBM did not have any expectations about how much would be incorporated by OSF, he said.

He said he did not believe the delay was a factor in the decision to evaluate Mach.

The Next step



Next, Inc.'s operating system shipped last week, 11 months after the company's workstation was unveiled. Interface Builder, utilized in the screen shot above, is included in the interface to the system's Mach version of Unix.

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NEWS SHORTS

NAS Europe off the block

After at least eight months of negotiations with National Advanced Systems (NAS) owners Hitachi Ltd. and Electronic Data Systems Corp., West Germany-based Compaq Computer Information Systems GmbH abandoned plans to buy NAS Europe. Last week, NAS said the European division was no longer for sale. Compaq, Hitachi's largest distributor in Europe, said the deal was supposed to be made for \$200 million. It announced that discussions were terminated Sept. 15. Soon to be known as Hitachi Data Systems, NAS "will operate as a global company," a spokesman said.

CIO tapped at Veterans Affairs

President Bush has nominated Edward G. Lewis to serve as assistant secretary for information resources management at the U.S. Department of Veterans Affairs. Lewis was previously director of management support services for the Bush-Bush campaign in 1988 and held a variety of management posts involving strategic planning in the U.S. Marine Corps.

Protest lodged on Air Force pact

Martin Marietta Corp. has filed a protest with the General Accounting Office that challenges a \$164 million contract recently awarded to Honeywell, Inc. If successful, the move could also deal a blow to subcontractor Apple Computer, Inc., which has agreed to supply the U.S. Air Force with up to 80,000 Macintosh computers. Martin Marietta's bid included supplying Sun Microsystems, Inc. workstations.

Delta seeks partners

Delta Air Lines is forging ahead in its efforts to merge its computer reservation system (CRS) with others. In June, Delta and AMR Corp., parent of American Airlines, canceled the proposed merger of Delta's Data II and American's Sabre when it was to be contested in court by the U.S. Department of Justice. However, last week, Delta, Northwest Airlines and Trans World Airlines announced that the three are discussing the establishment of a jointly owned, independently operated, neutral CRS for travel agents.

White House erasures challenged

Private groups such as the National Security Archives research organization have the right to challenge the White House decision to erase computer traces, said U.S. District Judge Charles Richey on a Sept. 15 ruling. The decision pertains to the research organization's lawsuit, which claims that electronic mail messages of the Reagan White House should be preserved as historical records [CW, Jan. 30], to move toward a trial.

High-tech hospital display planned

The "Hospital of the Future," a showcase of high-tech information technologies, checked into the Dallas Informast last week. The center, due to open next May, is the latest demonstration of systems integration know-how by Chicago-based systems integrator Andersen Consulting, which is sponsoring the center along with the American College of Healthcare Executives. Andersen has already set up systems integration labs for the manufacturing and retail industries. The \$5 million permanent exhibit will feature devices and systems from 20 different vendors and will stress open-architecture interconnection, including the developing Hospital Level-7 protocol based on the Open Systems Interconnect model.

Ely joins venture group

Veteran computer industry executive Paul Ely has been named a general partner of the Menlo Park, Calif.-based venture capital firm Alpine Partners. Ely, who recently retired from Unisys Corp., had been chief executive officer of Convergent Technologies, Inc. until it was acquired by Unisys in 1986. He also spent 22 years at Hewlett-Packard Co.

HP unpacks LAN Manager Unix port

BY PATRICIA KEEFE
CWT STAFF

Hewlett-Packard Co. moved a step closer to uniting Unix and DOS-based file systems when it shipped LAN Manager/X (LM/X), a Unix port of OS/2 LAN Manager, to Microsoft Corp. last week.

According to Microsoft, OEMs can expect to receive their ports immediately, which means users could see related third-party products as soon as early 1990.

Users are having "nightmares" trying to manage and find data located across different databases spread across multiple platforms, claimed Eric Wasolek, manager of distributed languages product marketing at Relational Technology, Inc. (RTD), which has endorsed LM/X.

Building LM/X into database file servers will let users create a logically centralized system with respect to file management. That would provide DOS users with a DOS perspective for files regardless of where they are, even though many are located on Unix machines, Wasolek said.

Having completed its contractual work for Microsoft, HP said it has begun limited delivery

of HP LM/X software running under its HP 9000 Series 800 and 300 technical computers, with volume shipments slated for December. Support for both Unix System V, Release 3 and HP/UX is provided.

Named Pipes support

Also shipping now is HP LM/X/OS/2, said to provide full Named Pipes support for both DOS and OS/2 clients. A version for HP's Unix and Intel Corp.'s 80386-based Vectra will be released in the first half of 1990.

Besides RTD, three other major desktop database vendors — Oracle Corp., Informis Corp. and Sybase Corp. — have added LM/X. According to Steven Friedland, CompuServe's Gersten Group, Inc., the four firms account for 85% of the relational database market for Unix systems.

Meanwhile, much to Microsoft's evident chagrin, HP made two related announcements.

First, it is negotiating a sublicense agreement with Microsoft that would allow HP to also offer its LM/X port to OEMs. Traditionally, Microsoft retains the OEM sales from its dealings with development partners. In addition, Microsoft will not bundle Transmission Control Proto-

col/Internet Protocol (TCP/IP) into LAN Manager, as planned.

Microsoft does not comment on its future relationship, said Mike Murray, Microsoft's marketing director of the networking business.

The sublicensing talks were prompted by a slight twist to the LM/X port. OEMs and users could conceivably have their choice of two Unix LAN Manager ports. This is because Microsoft acquiesced to AT&T's decision to bypass HP's Unix port to build one of its own.

According to Duncan Campbell, marketing manager at HP's Colorado Network Division, there is concern that the appearance of two competing LM/X ports will "confuse the hell out of the market." Microsoft denies this but did agree that the three companies are working to ensure interoperability.

Campbell said Microsoft "kicked out" TCP/IP software, which was developed months ago for Microsoft by Excelan, Inc. Instead, a reference letter from Microsoft will direct interested OEMs and users to HP for TCP/IP. Under LM/X, he claimed, "There is no letter and no announcement at this point," Murray said.

tioned.

Watson numbered himself among the many who acknowledge that the U.S. is currently caught in an education crisis that, especially when coupled with the financial allure of fields other than technology, threatens the quality of our next generation of technologists. Were he in his 20s, embarking on a career today, Watson said, he would be hard put to resist the staggering starting salaries available on Wall Street.

"I'm not sure where America is headed," Watson said, acknowledging that the uncertainty in his field is disconcerting to him. "I've never before felt that I knew where."

He added that he strongly believes the most exciting and productive days for both the industry and the country lie ahead. The threat, he said, lies in a potential failure of the will — not the resources or ingenuity — to prevail.

To the world front, Watson, who served for two years as U.S. ambassador to the USSR, suggested that we finance a "Marshall Plan for Russia."

Without such financial backing, he said, Soviet Premier Gorbatchev, whose stability is being tested by the ruble's accord with other national currencies, threatens the viability of his sweeping socioeconomic reforms. He could fail to maintain his power base, and we could witness the return of a USSR police state.



Watson: There is a failure of will

Thomas Watson Jr. honored, voices concerns

BY NEILL MARGOLIS
CWT STAFF

AUSTIN, Texas — Thomas J. Watson Jr. didn't wear a red "power tie" to the American Electronics Association's (AEA) awards dinner last Tuesday night.

He had to go to.

The 70-year-old chairman emeritus and former chief executive officer of IBM was honored as the 1989 recipient of the AEA's Medal of Achievement.

"I had very great luck at the IBM company — not only in picking the right father but in picking some very fine people to work under me," Watson told a crowd that delayed his acceptance speech by several minutes with a standing ovation.

"If I had it to do over," he quipped, "I probably couldn't find a company my father was the head of."

His humor-laced observations, however, turned serious and even grave as he voiced, both from the podium and in a

later interview, disturbing doubts about the future of the technology industry and the competitive stance of the U.S. in the global market.

In reviewing Watson's 34-year career at IBM, AEA President and CEO J. Richard Iverson noted that "he is a never lost sight of the fact that motivated people are the most important asset of any business venture."

He still believes it, Watson told Computerworld, but his horizons uncertainties as to where the country's industrial motivation is coming from today and whether it is sufficient.

"I don't know whether the U.S. is willing to make the sacrifices necessary to be the greatest nation in the world anymore," Watson said. He voiced sympathy for the effort to stay tax-free, but added that eventually, the country may have to face up to the fact as the only route to raising necessary revenue without increasing an already precarious federal deficit. "The Japanese aren't always going to buy our bonds," he cau-

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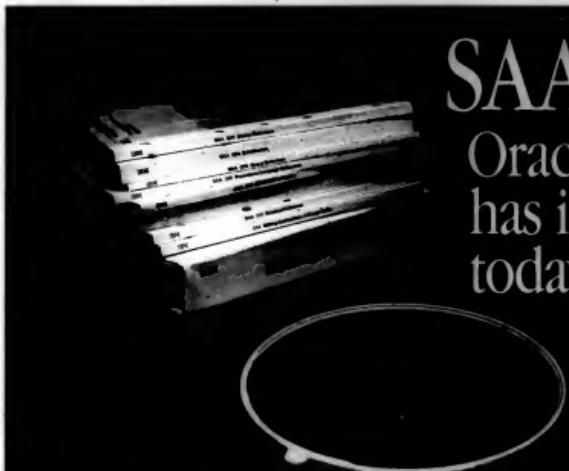
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Nynex readies net management scheme

BY ELISABETH HORWITZ
CW STAFF

TARRYTOWN, N.Y. — Nynex Information Solutions Group, Inc., the nonregulated arm of Nynex Corp., is expected to announce and deliver an integrated network management system early next year.

The as-yet unnamed product will compete with the likes of IBM's Netview and AT&T's Unified Network Management Architecture (UNMA) for the strategic position of "manager of managers" in corporate networking environments. The

Nynex offering is said to be designed as the focal point of the Open Systems Interconnect (OSI) network management model, which defines a central system to coordinate monitoring, diagnostics, configuration and data collection across different network management subsystems, said Gary Tjaden, executive director of integrated network management.

The product will interact with a variety of vendors' systems by supporting OSI protocols such as Common Management Information Protocol, as well as de facto standards such as Netview and UNMA, Tjaden said. Nynex will also de-

velop proprietary links between the systems and network systems that do not comply with OSI, he added.

Nynex's product will also be able to send commands to initiate testing and reconfiguration of network subsystems with that capability, Tjaden said. An object-oriented database will collect network statistics for later analysis.

By positioning its products as a manager of managers, Nynex will relegate other would-be centralized management systems such as Netview and UNMA to the status of "just another subnet," Tjaden said.

Nynex is also in the process of developing an expert systems component with the help of Polytechnic University's Center for Advanced Technology and Telecommunications, said Iwan Frisch, the center's director. The expert system will play the crucial role of analyzing an incoming flood of alerts and alarms from various parts of the network and determine the likely trouble source. In effect, Nynex has given no time frame for when the expert system will become available.

AT&T tools control long-distance use

BY JOANIE M. WEXLER
CW STAFF

BASKING RIDGE, N.J. — AT&T relinquished more control of its long-distance network to customers last week by announcing additional network management tools that support the company's Unified Network Management Architecture (UNMA) strategy.

The offerings extend the firm's suite of Accusmet Network Management Services, which serve the UNMA long-distance domain, across six functions: configuration management, fault management, performance management, network planning, accounting management and security.

The expansion of existing capabilities to other AT&T long-distance services, coupled with the introduction of new network management offerings, furthers users' abilities to take charge of their own network destinies.

"Ultimately, most sophisticated users want complete control of their networks," said Mike Harwitz, president of MTI Group, a communications consulting firm in Eastsound, Wash. "They don't want to wait to get their T1 links reconfigured or determine what their call expenditures have been. They want instant access to those things."

The new releases give users the following network management capabilities:

- Expansion of the existing Accusmet Information Manager to support alarm information and network configuration for Accusmet T4S and Accusmet Spectrum of Digital Services with graphic displays (availability first half of 1989).
- Electronic traffic data reports for Megacom, Megacom 800, Multiquint and 800 Validator services in addition to previously supported Software Defined Network (SDN) service (immediate availability).
- On-line, near-real-time, inbound-bound call detail data for SDN, 800, Megacom, Megacom 800 and Multiquint services (availability first half of 1990).
- Electronic bill delivery for private-line and SDN services (immediate availability).
- An option to AT&T Detail Manager providing customized billing reports for Megacom, WATS and 800 customers (availability fourth-quarter 1989).
- Reports highlighting potential fraudulent SDN usage through the Network Remote Access Monitoring System (immediate availability).

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CA liquidates Cullinet banking group

BY KELLY BOOKER
OF STAFF

GLENDALE TERRACE, IL. — The ax has yet to fall officially on Cullinet Software, Inc.'s next-generation integrated banking system. However, Cullinet's new owner, Computer Associates International, Inc., has already essentially dismantled the group responsible for development and support of the product, firing all but a select few of the 70 to 80 employees in its camp here, Computerworld has learned.

According to a source with close ties to Cullinet's office, pink slips were handed out to most of the development and software support employees. Of the 10 or so remaining workers, four have been assigned to other duties, the source said.

"We have no comment regarding any

specific numbers or offices," said a CA spokesperson at the company's Westwood, Mass., offices when questioned about the reported layoffs. However, the spokesperson said that the largest percentage of cuts made throughout Cullinet's worldwide work force were administrative and added that CA does not "anticipate any reduction in service or support for our old clients."

CA also reported an earlier promise to deliver "some paper" on Cullinet's manufacturing, human resources and banking products, in that order, sometime in the future.

Bank automation analysts were not surprised by the move to shut down Cul- lernet's operation. They said Cullinet's embryonic product claimed only a few beta-test sites, while CA already has a commercial banking product called Info-

point. CA bought into the banking industry when it acquired the former Uucel Corp. in 1987.

Top-ranked firm

The firm ranks as the top three among independent providers of banking software along with Kirschner Corp. in Ontario, Calif., and Hogan Systems in Dallas, according to M. Arthur Gillis, president of Computer-Based Solutions, Inc., a New Orleans-based bank automation consultancy.

Apart from the CA acquisition of Cul-

linet, Gillis said he did not believe the banking software was viable.

The Cullinet product "is brand new in a mature market," Gillis said. "A business does not grow on the basis of three sites."

The most prominent of those test beds was Exchange National Bank in Chicago.

In a short statement issued last week, Exchange National said it "is deriving important value" of the Cullinet banking package, which the bank began beta testing in August 1987 and hoped to put into service next quarter.

Computer Associates and the bank are talking, a bank spokesperson said, adding that CA has said it would support the Cul- linet system should the bank move to de- ploy it.

the banking system, the application generator and the Cullinet identity," said a former Cullinet manager. "CA is getting rid of all of them."

Users hope they will not be kept in suspense for long. At Cullinet User Week in Atlanta next week, CA reportedly plans to announce what software they will sell in its product-line plan. In the meantime, a tentative timetable prevails.

"There has been a lot of concern about support and future enhancements," said Pedro Silva, supervisor of database and operations services at Blue Bird Body Co., a school bus and luxury motor coach manufacturer in Fort Valley, Ga.

Silva said the white paper recently sent out by CA "appears to indicate they will continue to grow IDMS, especially with SQL," capability but noted that he had heard "no mention" of CA's plans for Cullinet's application software products.

However, James D. Herrick, manager of systems technology at Peabody Holding Co. in St. Louis, is not holding his breath for CA's growth in the Cullinet market.

Sayre, who was frustrated with Cullinet's lack of support for the VM portion of his mixed VMS/VMVS environments, Herrick said he decided to move his database, now IDMS, to IBM's DB2. "Over the next three or four years, we're getting out of IDMS," said Herrick, whose company put IDMS on-line in 1980.

Midwest correspondent Ellis Bookler contributed to this report.

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Executive offices empty

As was widely predicted, CA's pink-slip delivery began in Cullinet's executive suite. Founder and Chairman John Cullinet, President Robert K. Weiler, Executive Vice-President Landry III, Vice-President of Marketing Jeffrey Parker, all of whom remained through the transition, are divorced from Cullinet as of last week.

Parkers last week became vice-president of worldwide operations at Ottawa-based software vendor Cognex Inc.

Landy, often called Cullinet's technology guru, will now operate under his own flag, Agility Systems, a self-funded software start-up launched by Landy last week, is developing what he called "mail-enabled systems" that

will wed database and business application software to large interconnected electronic mail networks. Weiler, Landy's longest colleague, will sit on the Agility board.

Weiler, according to several sources close to Cullinet, will also serve as president and chief operating officer at Cambridge, Mass.-based desktop publishing company Interleaf, Inc. Weiler was unavailable for comment.

Cullinet will realize his often-voiced wish to return to his entrepreneurial roots. "I'm forming a company to pursue and invest in new business opportunities in emerging technologies," he told Computerworld.

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Insurers wary

FROM PAGE 1

competitive advantage for the company as a whole.

Although there is the potential for such a competitive advantage, the slow adoption of image technology, the insurance industry is proceeding only with relatively small-scale imaging prototypes.

This slow progress is the case, even though early results from the pilot projects predict 30% to 50% productivity gains. "Our clients will notice increased responsiveness almost immediately," said Kanis, assistant director of defined benefits administration at Cigna's group pension division.

But there is no widespread implementation. "Despite successful implementations in the last three or four years, image processing is still being viewed as experimental technology because the decision-making process is still very much on a traditional payback and cost savings," said Mark Bruneau, who recently completed a study of the early implementors of imaging for consultants Temple, Barker and Stowe, Inc.

Greedy adoption

Further evidence of the discrepancy between imaging's promise and its gradual adoption is its potential in the insurance field in market research statistics that show that the \$350 billion industry spent only \$60 million on the technology last year. Yet consultants predict that the insurance

market for imaging will grow to \$800 million by 1993.

At one time, analysts predicted that imaging in all vertical categories would be a \$10 billion industry by 1990. Today, they estimate the market will total \$6.8 billion by 1993, and only if vendors help users solve difficult implementation issues such as integrating imaging with existing systems.

The lack of large-scale investments in imaging in insurance and other industries is also evident in the continued financial struggles of Wang Laboratories, Inc., which is betting its future on image processing. The company is targeting insurance, among other areas. Wang's average installed system supports only 20 to 25 workstations, although the company can support up to larger installations, according to Roger Sullivan, Wang's imaging products program manager.

Other major vendors clearly see an opportunity in imaging, but they are only beginning to provide products. IBM just entered the field last year and is targeting minority states — totaling \$10.3 million — in Image Business Systems and iNet in June. However, the company has announced only two imaging applications in insurance, where the vendor does not meet most of the customer installations. The largest — USA in San Antonio — is only 13% installed.

New York Life Insurance Co. is considering a bid to be the first company to attain broad competitive advantage through imaging, John Foy, vice-president of

customer service, is trying to convince senior management that an approximately \$10 million customer service imaging application will provide the organization with an advantage. The application would save several million dollars per year and provide faster service, according to Foy.

"We intend to be the first with this scale of application," Foy said. "It may be a short-lived advantage, but if someone else does it first, we would be at a disadvantage. We're not waiting for them."

TRW, Inc., acting as a systems integrator, and IBM are vying for New York Life's proposal, which Foy said he believes would reduce processing time and cost and get policy information into customers' hands more quickly than the competition.

New York Life executives will have to make a "leap of faith" if Foy's proposal is to become a reality. In a time when companies are reluctant to make major capital investments, senior executives are steering clear of such uncertain judgments.

"We can foresee the opportunity to save money over five years over the way we handle paper today," said Tom Pettibone,

Large-scale processing

• With existing systems and the expense of the major pieces of equipment required.

"The real benefits with imaging come not from automating existing work flows, but rather from changing existing processes," concludes the paper.

Changing the work flow in a multibillion-dollar firm is a daunting proposition, but the shake-up may be worth it. For example, in the insurance industry — where a 2% market share of any particular line of insurance is an exceptional success — regulations govern most competitive factors. Companies can differentiate themselves only through better customer service.

"The real companies that are able to use imaging effectively will be the ones that on a broad scale will capture larger market share by providing faster, higher quality service," said Mark Bruneau, who recently completed a study of the early implementors of imaging.

MICHAEL SULLIVAN-TRAINOR

Image of success?

Despite early successes in small-scale projects, image processing is still not seen as a major technology, according to consultants and users. The reasons for the slow movement of imaging are similar to those confronting the implementation of many of today's emerging technologies, according to a white paper soon to be released by Nolan, Norton & Co. They include the following:

- Traditional cost-justification techniques. These rely on automating existing systems rather than quantifying new ones, preventing companies from investing in the technology because there is no documented payback.
- The reluctance to change the work process. Imaging affects the entire work environment and a company's case, requires new procedures, as well as major redevelopment of systems.
- Lack of knowledge. Image applications fall outside the experience of nearly every information systems manager today because the technology has only recently matured to facilitate

senior vice-president in charge of information systems at New York Life. "But what is the value of improved customer service?"

The reluctance of executives to approve expensive projects promoting intangible benefits is one of the biggest problems with image processing. Traditional cost-justification techniques do not work, nor do small pilots. The only way to find out if imaging is for real is to implement it on a large scale and allow business processes to change along with it, according to users and consultants.

A single image workstation can be obtained for \$10,000, but consultants recommend a minimum investment of \$150,000 to \$250,000 be invested in software, hardware, networking and applications development to achieve the benefits of the technology.

"The cost of the technology is still high enough that if you're looking for a payback, you have to spread it out over a large number of users," said Barry Cimerman, an image processing consultant based in Upper Montclair, N.J.

Starting small
Rather than take the risk of spending millions on a large application, companies are continuing to experiment by implementing small projects before writing for another firm to move first. Although the pilots are not revealing the anticipated benefits of large-scale applications, they are helping companies learn about how imaging changes the work process. This knowledge

will be vital if companies are forced to catch a competitor who attains competitive advantage with the technology.

"If we're profitable now, why risk money for what may be a marginal improvement in profit?" said Robert Apel, a vice-president at Allstate Insurance Co. "We'll simply wait and do nothing, other people will risk the money, and it will take us no longer than six months to catch up."

Companies such as Allstate are looking very closely at USA, the largest imaging application in insurance so far. Some 1,500 people,

many of them insurance executives, have participated in IBM-sponsored tours of the new system.

So far, some 300 workstations are up and running for a property and casualty policy services application that will involve 1,400 workstations.

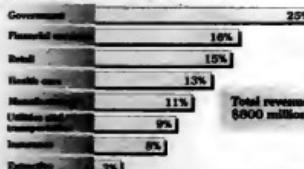
By using the system, USA expects to save \$5 million per year in support staff, space for paper files and supplies. It costs approximately \$5 million a year to operate the system, said Charles Plemons, director of image systems at USA.

Meanwhile, at Cigna, Kanis is completing a shakeout of his application, which runs on a Wang VS and interacts with the company's IBM mainframe. Like many of those running image applications, Kanis said he hopes that his project will inspire the rest of the company and prove the intangible benefits of the technology.

"This is a very large prototype," he said. "It's a model for the rest of the company."

Multiple images

The market for electronic imaging in 1988 was widely dispersed among industries, with government taking up the largest share



SOURCE: KANTAR CONSULTING GROUP INC.

BY MICHAEL SULLIVAN-TRAINOR

PC card powers link to IBM mainframes

IBM Personal Computer users can now hook up to IBM mainframes at a 64K bit/sec. using a combination of AT&T hardware and Digital Communications Associates, Inc. terminal emulation software.

Last week, AT&T announced a plug-in card that is said to allow PCs to communicate over a 64K bit/sec. communications link to an AT&T private branch exchange (PBX),

using either the ISDN Basic Rate Interface (BRI) or AT&T's Digital Communications Protocol (DCP).

DCA concurrently announced a software package providing the same capabilities as DCA's existing IBM 3270/79 terminal-emulation and file-transfer software over either of those links.

The DCP side of the products

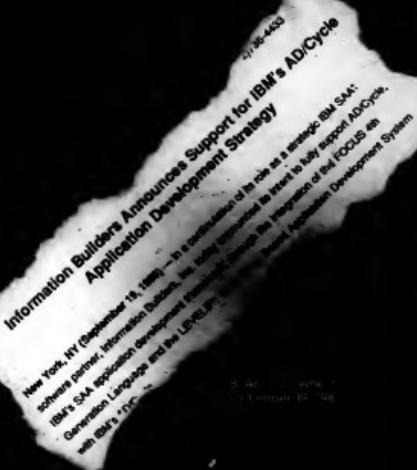
proprietary protocol is now installed on approximately two million lines and runs on all of AT&T's major PBX lines, AT&T spokeswoman Sue Flemming said.

AT&T's BRI card will work only with AT&T switches until the standard is more fully defined, she added. Only AT&T's SESS central office switch and Definity Generic 2 PBX now support BRI.

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EDITORIAL

Fund and games

EVER TRY JUGGLING Jell-O? That's sort of what the federal government has been doing over the years in trying to define and implement a cohesive and consistent set of trade and domestic manufacturing policies relating to the computer business. The effort is daunting, the execution awkward and the results usually messy, even embarrassing.

This is not the fault of any particular administration or political party but rather the nature of the beast. Still, in its own way, the government muddles along, wondering why it never seems to get closer to its goal.

This month, the Bush administration took its first crack at Jell-O juggling, unleashing a policy designed to both prop up a badly ailing U.S. supercomputer industry and establish a national information network.

It is a very ambitious effort, which some are comparing to the science and R&D thrust supported by the feds three decades ago after the Soviets beat us into space with Sputnik. Bush's plan is a five-year effort carrying a price tag of \$1.9 billion — about the price of three Stealth bombers.

Oh, yeah, there is one small catch: No one in Washington, including the president, will say whether there will actually be any money to pay for the program.

All the efforts to forge an active high-tech pol icy, including the current one, beg the question, "Do we really need one?" The correct answer is yes, and for at least two reasons.

The first is that governmental and quasi-governmental agencies in Japan have successfully stimulated and enriched the competitiveness of that country's computer industry. However, the most potent weapon deployed in this effort has not been restrictive import policies; instead, government-sponsored research and a secondary education system that ensures high-quality, uniform education throughout the country have fueled Japan's growth.

The second reason is the integrated European marketplace starting in 1992, which could well foster a self-sustaining protectionism. Already the European nations have imposed stiff tariffs onto U.S. semiconductor exporters, whereas formerly the chips entered the continent duty-free.

So, yes, a policy is needed. But what? Hasn't the record shown that the government's past trade and manufacturing policies resulted in higher prices and less selection for U.S. consumers?

The policy that has worked repeatedly is the one in which the federal government gets serious about funding all levels of education, from meal programs for needy first-graders to super-computer R&D funding for universities. History has demonstrated that most other efforts to democratize trade and stimulate domestic output get gutted by political squabbling and pigging out at the pork barrel.



LETTERS TO THE EDITOR

Ad-monition

With the knowledge that an OS/2 Presentation Manager Extended Edition PS/2 and jobs of men are required to run RSA/SAA/CUA, I am still wondering how the high workstation cost was going to be justified. It was therefore heartening to read RSA's back-page ad [CW, Aug. 28]. According to RSA, SAA/CUA helps to "maximize your investment in both personnel and hardware."

It's always nice to know how to maximize my investment. I wonder, however, how RSA will help to maximize my returns on that investment.

Peter Eick
Madison, Wis.

Advanced weapons

I must take exception to "High-tech weapons, low-tech 'GIs'" [CW, Aug. 21]. This story does not reach your normal high standards for thorough research and balanced reporting. By changing the name and profession, the article could just as easily have been "High-tech offices, low-tech managers."

Whenever the user of a system considers the computer's response so superior to his own senses that the human reading is ignored, the user is in trouble (and probably poorly trained). Mr. Collins' remarks show solitaires accepting a faulty first test without realizing over what can clearly be seen easier to every financial analyst who has not performed a "yes/noable" test on an analysis.

I hope that the U.S. Department of Defense continues to develop and test new high-tech weapons systems. The ones that do not work can be identified in

peacetime at a lot lower cost in dollars and lives than during a war. If at some future time my friends or my son have to face an enemy, I want them to have the most advanced high-tech weapons available, not some tired old true low-tech bayonet.

Ernest J. Denner Jr.
Delano, Minn.

Watch it

"From fancy to fact" [CW, Aug. 14] prompted me to think of the other scenarios that we all may go through when "the computer may become a basic part of one's attire, as essential and as extraordinary as a wristwatch."

We all know the pleasure and pains of running our life according to watches. Is wearing a watch an ordinary event? I think we have given away our liberty and freedom to the world because that slowly creeps forward to remind us of our next office meeting, the appointment with the dentist or the bills we have to pay.

If the wristwatches have invaded our freedom and liberty, imagine what the wrist computer can do to our life. We will be in constant touch with our office. Imagine all the work we will be forced to accomplish when we wait in the airport to catch a plane! Imagine streets full of people walking around staring intensely at their wrists to know the street. Does anyone average or the individual himself? Just as we sneak to look at someone else's wrist to see the time, others will start to sneak a peek at other's wrist computers.

We may certainly have all the good things this new technology can offer. At the same time, however, we should look at other problems and opportunities this

new technology may bring us.

Chetan S. Sander
Management Department
Auburn University
Auburn, Ala.

Turnover time

Regarding "The call of greener pastures" [CW, July 31], no what if there are greener pastures elsewhere? In the IS field it's been a seller's market in most places for more years than I can remember. Employers keep turnover down to reasonable levels by managing for retention. This requires putting as much emphasis on the "keeping" side of the staffing equation as on the "getting" side.

There are two key elements to this strategy. First, employers have to view the entire employment life cycle from the beginning of ads to career planning — to identify where they are making themselves vulnerable to turnover. Second, and most important, they must hold line managers at least partially accountable for turnover.

I want managers to pass the 3 a.m. test — if you wake them at that hour and ask them what their bosses measure them on, turnover should be on the list. We're past the stage where human resources can take full responsibility for finding — and keeping — good people.

Gil Gordon
Gil Gordon Associates
Monmouth Junction, N.J.

Computerworld welcomes comments from its readers. Letters may be edited for brevity and clarity and should be addressed to Bill Lederer, Editor, Computerworld, P.O. Box 9171, 376 Chestnut Road, Framingham, Mass. 01701.

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SYSTEMS & SOFTWARE

SOFT TALK

Stanley Gibson

Sharpen those pencils

Some time in the next century, there will be a movement to revive hand-crafted software.

This will come as a rebellion against the dehumanizing mass production engendered by computer-aided software engineering once it takes over. Given the rate of acceptance of CASE, that could be a while yet. But it will come.

Why in this bound to happen? Nostalgia and status-seeking: two of the most powerful elements in human behavior, will always triumph over practicality.

The nostalgia for handcrafting is strong and will reassess itself, as it always has. We have seen this in so many fields; why not in software? For example, hand-carved, gilded signs have largely replaced the machine-

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Inside

- New York schools get automated. Page 25.
- Intel's 1600 chip loses its shine. Page 25.
- CA rolls out tools for PCs, LANs and mainframes. Page 26.

AFCOM says 'lights on' for now

Managers balance automation with search for quality, job redefinition

ANALYSIS

BY AMY CORTESE
CW STAFF

KANSAS CITY, Mo. — Two years ago, the promise of "lights-out" data center operations had information systems executives conjuring up images of darkened, self-supporting data centers humming away without human intervention. Those initial expectations have been tempered by time, as evidenced by the more realistic expectations of operations managers at the recent Association for Computer Operations Management (ACOM) conference on automated operations.

While most of the 325 attendees believe that unattended operations are attainable in the foreseeable future, most have plans under way to automate operations to unprecedented degrees (see story, page 65). "We're not talking lights out or unattended; we're talking automated," said Robert Taylor, manager of computer processing with Northrop Corp.'s aircraft division.

Similarly, Kris Duffo, an operations manager at Spartan Stores, Inc., in Grand Rapids, Mich., said, "Lights out is not realistic for most." More likely, he said, data centers will be certain to run automatically, for instance, weekend or night shifts — and mostly rely on human staff to supervise routine operations that have been automated. The driving force behind

automation is to increase the quality of service as well as reduce staff requirements and associated costs, according to attendees. Often, automation is seen as a step necessitated by hard times.

"The ones that move the fastest [to automate] are the ones in trouble," said Gary Purvisance, an operations manager with Kaiser Aluminum in Spokane, Wash. Kaiser, which has undergone two changes of ownership in the past couple of years, has had to cut back on staffing. As part of the consolidations, a data center in Oakland, Calif., with a staff of 70 people was closed, leaving the Spokane data center to handle the extra work.

Purvisance ties the shop's ability to handle the work of two data centers to hard work from remaining employees and software that has automated many functions. For instance, report distribution has been automated, with all printed output produced in four-hour "dark" printing periods each day. Purvisance said his shop is also looking to redesign the system to provide more on-line output and begin automating console operations.

In other cases, the decision to automate results from a careful study weighing the benefits against costs. John Cunningham, deputy division chief of the operations division at the Defense General Supply Center in Richmond, Va., said his operations are about a quarter of the way to a goal of 80% to 90% automation by 1992. "It's an expensive busi-

ness decision, but we look at it as increasing service to the customer. You can't compromise that into savings," he said.

Cunningham said that after visiting state-of-the-art data centers, such as that of Electronic Data Systems Corp. in Dallas, an automated operations team identified seven categories of software needed to automate the supply center's operations, including scheduling and report and problem management.

Like most attendees talking about automating, Cunningham stressed that he did not expect to lose any staff but rather intended to redefine jobs. "In most cases, they end up with better jobs," he said. Currently, a training officer is examining the issue to identify new assignments.

The attendees hailed primarily from large IBM shops — not surprisingly, most of the unattended product activity is. Robert Orre, systems control resource supervisor for Johnson Wax, a division of S.C. Johnson & Son, Inc. in Racine, Wis., observed that the products for unattended operations exist.

Continued on page 32

Controller update ready

BY ROSEMARY HAMILTON
CW STAFF

By the first quarter of 1990, IBM users will finally have complete 3990 Model 3 controllers available to them as the long-awaited extended functions become available.

This latest schedule, which IBM quietly announced earlier this month, comes more than a year after its original shipment date for its most advanced controller. IBM said that the direct-access storage device (DASD) Fast Write extended function will be available in December and that it would follow that with the Dual Copy feature in the first quarter of 1990.

In early 1988, IBM announced that it would not meet its target shipment date of the 1988 third quarter for its 3990 Model 3. In September that year, it announced that it would ship the unit without the extended functions by December. At that point, IBM said the extended functions would be available under an Early Customer Support Program in the first half of this year but did not release an official availability date.

The controllers, which have been shipping since December 1988, are fully functional units. However, the extended functions help users get more performance out of them. The DASD Fast Write feature increases the performance by as much as three times as compared with a magnetic controller. The Dual Copy function increases data availability by automatically creating two copies of information and storing it in the subsystem.

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CA stacks up product enhancements

BY ROBERT MORAN
CW STAFF

Although Computer Associates International Inc. was busy addressing high-profile concerns about the fate of recently acquired Cullinet Software Inc.'s IDMS database two weeks ago,

it also announced a series of products and enhancements that shore up its offerings of applications development software on the mainframe, the personal computer and local-area networks.

The following products, which are as yet unpriced, will

arrive in beta testing in the fourth quarter of this year and throughout 1990, the company said.

CA-DB-Close is an application development package for mainframe relational development systems that is compatible with the DBase language from Ashton-Tate Corp.

The product will use the C programming language, which will permit portability across multiple hardware platforms, the company said.

Furthermore, the nonprocedural query system, which includes a panel, Help and error message facilities — will allow organizations to "take advantage of the large talent pool

of programmers knowledgeable in DBase," according to CA Chairman Charles Wang.

CA-Ideal Release 2.1 is an application development system that supports the SQL option to CA-Datascom/DB 8.0 and extends data management support to VSAM.

With the new release, users will reportedly be able to embed SQL directly within CA-Ideal procedures or allow the product's data manipulation language to generate the appropriate SQL requests for them.

The release also supports closer integration with IBM's DB2. For example, IBM's DB2 will be able to call a CA-Ideal exit to determine the appropriate application plan name at the beginning of each logical unit of work. A CA-Ideal procedure definition language statement will permit the plan name to be modified.

The closer integration, according to the company, will allow the product to take better advantage of DB2's ability to associate application plans with CICS transactions.

CA-Ideal/PC is a PC-based workstation for the development and execution of CA-Ideal applications; it includes a nonprocedural panel and report definition facilities. Organizations will be able to develop and execute applications on the CA-Ideal panel and run programs on the mainframe without modification, the company said. The initial PC-DOS release will be followed by a release that will support OS/2.

CA-DB/PC is a relational database for PC-DOS and OS/2, which the company said will provide full compatibility with CA-Datascom/DB, including SQL support. In addition, the product will contain precompilers for embedded SQL in Cobol, as well as C, and it will initially be released for DOS, followed by a version for OS/2.

CA-DB-Server will support database server configurations of CA-DB/PC in LANs. CA-DB-Star/PC reportedly allows integration with CA-DB-Star, a distributed database manager that permits distribution of CA-Datascom/DB between the mainframe and PCs.

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HARD BITS

Unisys goes for Filenet imaging

Unisys Corp. selected Filenet Corp. to provide it with imaging software for the Unisys hardware platform. Unisys did not specify when it would begin marketing the system. Filenet is planning to port its Image Access Facility software to the Un-

sys hardware over the course of the next year. A Unisys spokesman said that the project is expected to involve both high-end systems and personal computers.

Storage Technology Corp.

age Tek will provide the ACS directly to Bull customers.

Sequoia Systems, Inc. said it has standardized on the small computer system interface technology for its mass-storage interface. The intent of this move is to give Sequoia access to a host of peripherals on the market for use with its fault-tolerant systems.

Gibson
FROM PAGE 23

made neon of the 1950s in many areas.

Similarly, an executive with a handwritten, custom-programmed executive information system (EIS) is bound to claim a cache of peers cannot match. He will lord it over other executives who use cookie-cutter EIS systems, chomped out masses on the cheap by some CASE tool.

Not only will handcrafted software become the executive yuppie rage, but software engineers, who will pretentiously don the label "software craftsman," will look down their noses at any but the most laboriously created codings. Anyone who can't appreciate their work will be looked down on as someone who just doesn't know.

There are likely to be colonies of craftsmen springing up, creating precious dedicated software products. There will be found more crafts colonies in picturesque seaside towns, opening shops for tourists.

There will be theme parks: "Rte 128 of the 20th Century," And "The Old 101 Trail," in Silicon Valley. They will have recreations of 20th-century office buildings with programmers clad in period attire: blue jeans and golf shirts for development managers; T-shirts, beards and ponytails for hard-core programmers. They will pore over workstations, turning out programs that will be put on sale in the parks' gift shops.

Tourists of the future will seek out the people in their RVs, desiring to go back to a quieter, slower time. The tourists will be heard telling their children: "Look, Billy, that's how your great-grandfather used to earn his living, writing software by hand." The child, barely paying attention, will breathe a sigh of relief that he won't have to live out his days like that.

In community centers around the country, there will be spring up crafts classes in the evening for adults wishing to broaden themselves by writing their own software.

Just as the art of calligraphy continues to be popular among hobbyists, despite the fact that the printed word is one of the most ubiquitous documents in the world today, so coding in Cobol is bound to catch on again.

Advertisements will appeal to possible students: "Learn Cobol, the forgotten art. Impress friends and feel the satisfaction of writing something yourself."

So, don't get carried away by the promise of CASE. Enjoy the spiritual satisfaction of writing in Cobol while you can.

Gibson is Computerworld's senior editor, software.

Do You Play Beat-The-Clock To Get Your Payroll Changes In On Time?

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For instance, PC/Payroll's unique Report Writer feature allows you to directly produce inquiry reports from information stored in the database—in minutes! And the best part is, once you have the reports, they can be output to the screen, printer or disk file, and the formats can be saved and modified for future use.

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The creator of the AS/400
left a few things out.



NEW PRODUCTS — SYSTEMS

Power supplies

Electric Specialists, Inc. has expanded its Insistor family of AC line protectors to include models for computer-aided design and manufacturing systems.

The units reportedly include 30kV surge amp suppressors and provide wideband, high-extinction filtering for system isolation and protection.

Available in commercial, industrial and laboratory grades, the protectors are used to prevent power line interaction between the workstation and the computer or peripheral. Options include power fail interrupt, remote monitor switching and 20-amp models.

Pricing starts at \$100.

Electronic Specialists
171 S. Main St.
Natick, Mass. 01760
508-655-1532



ISO-1, an Insistor line protector

Tessing Industries, Inc. has added a 500-watt model to its line of uninterruptible power supplies (UPS).

Called Model UPS-5150H, the UPS has a total rating of 500 watts and the 3-by-11-by-17-in. cabinet is the same as the company's 200-watt Model 3150, the vendor said. The unit reportedly provides power fluctuation security for small medium file servers, Intel Corp., 80386-based personal computers with high-resolution monitors and multi-user servers with attached terminals. Modular battery extension units are available.

The UPS sells for \$549.

Tessing Industries
Suite 240
2001 Westside Pkwy.
Alpharetta, Ga. 30301
404-564-5944

Exide Electronics has extended its family of Powerware Uninterruptible Power Systems with the addition of the Powerware System 50 and the Powerware System 150.

The System 50 reportedly meets power requirements of 20 to 50 kVA for midrange systems such as the IBM 9370 and DEC VAX 8600. Pricing for the system starts at \$28,600.

The System 150 can handle

loads that range from 100 to 150 kVA IBM mainframes and DEC 8000 Vaxcluster environments, the company said.

The product is priced from \$61,200.

Exide Electronics
3201 Spring Forest Road
Raleigh, N.C. 27604
919-872-3020

Processors

Painit 4 Data Corp. has announced the Model 386/25, a 25-MHz, 80386 system based on the Intel Corp. 80386 microprocessor.

The product reportedly runs under the SunOS Crossover system XENIX V3.2 operating system and is offered in desktop and tower configurations. It supports up to 64 users, provides up to 24M bytes of random-access memory and is targeted at entry-level or midrange multicuser computing environments.

Pricing starts at \$7,400.

Painit 4
15442 Del Amo Ave.
Tustin, Calif. 92680
714-259-0777

Mercury Computer Systems, Inc. has announced the release of the MC6400VS, a 12 million instructions per second, 25 million floating-point operations per second attached processor designed for a single slot in the Sun Microsystems, Inc. Sun-3 and Sun-4 workstations.

The double-precision processor reportedly offers as much as 64K bytes of on-board memory and runs at an 80-mHz clock speed. The product includes C and Fortran compilers.

Package pricing begins at \$25,000 for a 16-Mbyte system, and versions are also available for the Motorola, Inc. VMEbus, Mercury Computer Systems 600 SunSoft St. Lowell, Mass. 01854 508-458-3100

Data storage

Nemoxix, Inc. has unveiled the NX860-CTU, a cache and translation buffer upgrade for the Digital Equipment Corp. VAX 8650 mainframe cache. The range from 1.6K to 544 Kbytes and stretches the translation buffer from 512 to 2,048 entries. The product is reportedly a two-board set, exchanged for the DEC L0204 and L0205 VAX 8600 processor boards.

Backed by a lifetime warranty, the upgrade costs \$45,000.

Nemoxix
106 South St.
Hopkinton, Mass. 01748
508-435-9087

Cleartpoint Research Corp. has announced memory upgrades for the Digital Equipment Corp. Vaxstation 3100 systems.

The DCME-312M is reported to be available in 8M-, 12M-, and 16M-byte removable array cards. The cards allow users to configure Model 30 and 40 systems to a total of 16M, 20M, 24M or 32M bytes. According to the company, the cards connect to the CPU board using DEC's factory-installed connectors and are customer-installable.

Pricing is \$5,400, \$7,200 and \$9,600 for the DCME-M31/8MB, DCME-M31/12MB and DCME-M31/16MB, respectively. The three models are supported by a lifetime warranty and a 24-hour replacement policy.

Cleartpoint Research
35 Parkway Drive
Hopkinton, Mass. 01748
508-435-2000

Trimarchi Inc. has announced a tape system that reportedly connects directly to its Ethernet network and provides 12G bytes of unattended, redundant backup.

Ethergate, a member of the company's Etherdrive family, reportedly supports Digital Equipment Corp.'s LAVX software and provides multilevel, scheduled, programmable backup with electronic mail logging notification.

The price is listed at \$7,000 for a 2K-byte tape-transport unit.

Trimarchi Corp.
P.O. Box 560
State College, Pa. 16804
814-234-5659

I/O devices

Talaris Systems, Inc. has announced the 1590-LN Printstation, a 15 pages/min. multilaser printer system.

The product is reportedly based on the Riscorp 4150 engine, features emulation of DEC VAXes and Cray Research, Inc. supercomputers.

Talaris claims the benefit of standardizing on one printer for automation software for non-IBM environments.

When asked what attracted him to automated data center operations, Janet Sieuw, a computer operations analyst from Singapore Airlines, said, "There is an

according to the company, optional Sharepool Cards and cables are available to permit access to a printer by up to four terminals as far as 100 ft. away. An optional envelope feed is also said to be available, permitting sequential printing of page and envelopes.

The printer costs \$7,995.

North Atlantic Industries
60 Plaza Ave.
Hauppauge, N.Y. 11788
516-582-6500

Carroll Touch, Inc. has introduced an industrialized touch-active 512-by-256-pixel flat-panel electroluminescent display.

Concurrent releases faster Cobol compiler

BY SALLY CUSACK
CW STAFF

TINTON FALLS, N.J. — A Cobol development environment created for real-time transaction processing markets, including securities and trading systems, banking, insurance, health care and other industries, has been released by Concurrent Computer Corp.

Code software runs under a proprietary OS/32 operating system and was designed to provide highly optimized code for the vendor's Series 3200 hardware platform. According to the company, applications developed with Code perform on an average of three to four times faster than those developed with Concurrent's previous Cobol compiler offering.

Targeted for commercial programmers, the software pro-

vides an interpreter for developing, prototyping and testing and a compiler for program execution. Programs are developed by compiling to and debugging intermediate code rather than machine code, which reduces development time and allows for a quicker editing, compiling and debugging cycle, according to the company.

The Code product set includes a code compiler and debugger, a symbolic debugger, a form package, a performance profiler, utilities and additional tools.

Pricing for the software ranges from \$6,250 to \$24,760, depending on the processor class. Another version has also been made available for the IBM Personal Computer and compatible machines. Code/PC is priced at \$2,995. Both products are currently shipping.

awareness that you have to [move] towards the Web. The objective is 'not so much cutting costs, but to eliminate errors stemming from conditions such as mental fatigue that often accompany night shifts,' says explained.

Despite toned-down expectations, some users do think uninterrupted operations are achievable. Joseph DiBlasi, director of administrative services at Boston University, said that by 1990, the university will have no console operators. BU's operations staff has shrunk from 31 in 1987 to 11 today. Plans call for only seven employees in January 1990, who will be redeployed during the following year, after other areas of cost through attrition.

DiBlasi stressed that no employees would be adversely affected and that the driving force for automating is quality: "Any user who looks at it from purely a cost savings is missing the point."

The hermetically sealed display unit reportedly was designed for harsh environments. The product is said to feature a low-profile touch frame that measures approximately 9-in. wide by 11-in. high.

The 11-by-7-by-3-in. unit includes eight-level brightness control, an audio emulator and a single RS-232 interface, according to the company.

The price is listed at \$3,896, and quantity discounts are available.

Carroll Touch
P.O. Box 1309
Round Rock, Texas 78680
512-244-3300

Once again, it took IDEA to complete the picture.

Ask IBM about the connectivity capabilities of the AS/400 and they'll say they've got all the pieces put together.

Sure, they've integrated PC Support into the host system, but upon closer inspection, you'll see there are a few details that Big Blue has overlooked.

Diminished host performance.

With PC and PS/2 users connected to the AS/400 via PC Support, you may discover you'll require a larger CPU or a second one just to handle your basic computing needs.

Running PC Support on the AS/400 consumes a lot of expensive host resources - at least 300-500K of host memory per user. And that's probably enough to bog down the host and make it unable to process data at the pace your organization needs it.

PC memory loss.

By accessing the AS/400 via PC Support or a Token Ring connection, your PC doesn't have enough memory left to concurrently run the PC applications it was designed for. The combined functions of PC Support take up more than the 640K memory allotted by DOS. Which means you'll be loading and unloading PC software applications to stay within DOS.

Eventually, a PS/2 running OS/2 may solve

this memory consumption problem, but can you afford to replace all your existing workstations?

Feature limitations.

To make matters worse, PC Support restricts your terminal and printer emulation options. It doesn't offer Model 3180 emulation, so you can't work in 132 column documents. There's no Model 4214 printer emulation. And you'll find PC Support is pre-configured for IBM PC printers only. Configuring your third-party equipment will cost you time, money and aggravation.

We put it all together.

If all this leaves you puzzled about the connectivity of the AS/400, you should know there is a solution - the IDEA family of 5250 emulation boards and software.

Our local, remote and gateway connections bypass PC Support to give your PC enough memory to run PC applications while it concurrently accesses the host.

In fact, we give you more sessions while using a great deal less PC memory.

Our connections make optimum use of all your existing equipment - third-party printers and PCs and PC-compatibles running DOS or OS/2.

And we also offer an Adapter Handler if occasional access to PC Support is desired by any of the users on your system.

For the complete picture, call IDEA at 1-800-257-5027. We'll show you how to put all the pieces together.

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Index Technology

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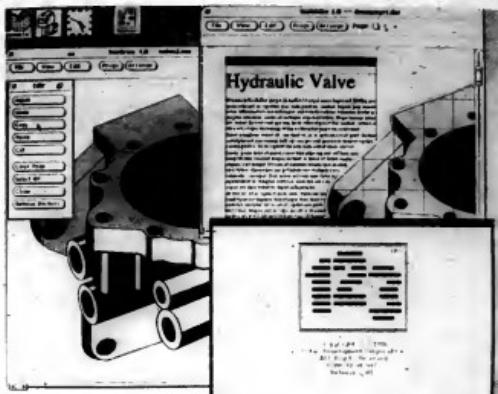
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The color of NEC laptops

BY MICHAEL ALEXANDER
CW STAFF

WOOD DALE, Ill. — With the debut of the Pro Speed CSX portable computer next month, NEC Home Electronics (U.S.A.) Inc. will be the first firm to ship a laptop with a color LCD, according to a NEC marketing representative.

"It's a niche product," said Michael Pritchett, product manager of laptop computers for NEC's Computer Products Division. "Initially, we expect that it will appeal to such users as the medical profession, where color is important in medical diagnostic software."

The new portable sports a color LCD with an 8.3- by 5.2-in. viewing area and supports IBM's Enhanced Graphics Adapter and Color Graphics Adapter video modes in color and Video Graphics Array (VGA) mode for text.

In addition, the Pro Speed CSX uses an Intel Corp. 16-MHz 80386 SX microprocessor and comes equipped with 2M bytes of random-access memory, which is expandable to 4M bytes with a memory card, a 1.44-Mbyte, 3½-in. floppy disk drive and either a 42M- or 100M-byte hard disk drive.

The laptop weighs 18½ pounds, including a built-in AC adapter, and measures 15 in. by 14.4 in. by 4 in.

NEC said that it will begin shipping the new unit in October at a suggested retail price of \$8,499, plus the 42M-byte hard disk drive. It will cost \$9,499 with the 100M-byte hard disk drive.

Wendy's system finds the beefs

Troubleshooting service reps now fix mechanical glitches in record time

ON SITE

BY JAMES DALY
CW STAFF

DUBLIN, Ohio — The next time you order a cheeseburger at your local Wendy's restaurant and that little slice of cheddar is not completely melted, fear not. Help is on the way.

While the fast-food industry has gulped down high-tech faster than a teenager goes through an order of fries, the fables of managing sophisticated ordering and cooking equipment have sometimes made the job of getting a sizzling burger from the grill to your mouth a nightmare for the support staff.

That scenario is changing at

Wendy's International, Inc. In May, the company installed an elaborate expert system that makes the task of fixing a fry-o-lator or repairing a point-of-sale terminal a veritable snap.

Until recently, if equipment was on the blink, the store manager would call Wendy's Field Operations Support Center (FOSC) and explain the problem to a service representative. The troubleshooter would then have to rely on his own expert system — the human brain — to solve the problem, often leaning on two or three months worth of training,

thick user manuals and a smattering of personal experience to iron out wrinkles.

Trouble was, there were holes in the method. Sometimes, it was difficult for a store manager to precisely describe what was wrong, or a manual had not been updated. The idea behind the system is that the first expert system came about "to have a single reference source for all diagnostic activities," said Brad Stabile, Wendy's director of information systems.

Today, Wendy's has installed 1st-Class Fusion by 1st-Class Expert Systems, Inc. in Way-

land, Mass. Service representatives now man an IBM Personal System/2 Model 30 that walks them through the problem resolution cycle, dropping down through a series of pertinent questions and providing answers at each level. The system also allows the dozen FOSC staffers to display graphical representations of each piece of equipment, allowing for more precise explanations.

"With a typical problem — say, trouble with a wireless headset — the system will often identify rep from problem to solution in a matter of minutes," Stabile said. He added that anyone at Wendy's 1,100 company-owned stores can access services 24 hours a day, seven days a week.

Stabile has nothing but praise for the new setup. "Our productivity has increased, as has the consistency in solving problems," he said.



Agreement positions DAT for market move

BY MICHAEL ALEXANDER
CW STAFF

COSTA MESA, Calif. — A recent agreement between record companies and makers of digital audio tape (DAT) recorders could not have come at a better time for end users of DAT backup storage systems, according to Kenneth Campbell, vice-president and general manager of the DAT product division at Archive Corp.

After several years of acrimonious debate over copyright protection, the music industry and makers of DAT recorders recently signed a pact that will finally permit American music lovers to buy DAT recorders.

If sales of DAT recorders, which are slated to begin here early next year, take off as expected, manufacturers will be able to ramp up production for both music and tape backup machines. The economics of scale will make the price of DAT backup systems even more attractive to corporate customers, Campbell said.

Archive has been quietly showing off its new Python DAT drive in a half-height internal and an external version. The company said last week that it will be among the first to introduce "consumer-grade" DAT backup systems for personal computers, workstations and other computer systems. While the DAT re-

cording mechanism and tape used in data storage are identical to those used to record music, Archive's units have been engineered specifically for computer storage, Campbell said. They are more reliable and smaller than consumer DAT recorders and are engineered to better cope with excessive tape tension variations, uncontrolled stops from high speeds and other characteristics of DAT transport mechanisms, he added.

A single DAT, only 4mm wide in a cassette about the size of two matchbooks placed side-to-side, is capable of storing up to 1.3G bytes of data using helical-scan recording techniques — the same technology used in videotape recorders.

The tape cells for \$10 but could cost as little as \$5 in only three years, Campbell said. Improvements in design and longer tape lengths will make it possible to eke out as much as 4G bytes of

storage on a tape in only a few years, he added.

The company also plans to market a cartridge loader capable of automatically loading up to five tapes, which contain 6G bytes of storage capacity.

The nascent DAT market will also be driven by several other factors beyond the prospect of becoming a low-cost storage alternative. "Customers are asking for greater storage capacity at a lower cost, smaller form factors, reliability and unattended backup," Campbell said. The Python, with its half-height form factor and optional loader, meets those needs, he said.

Archive has not announced a price for the drives and loader, although they will probably be priced at approximately \$3,000 and \$10,000, respectively, Campbell said. The company plans to introduce the drives in October and begin shipping evaluation copies in December.

1 Can a PC database server really replace a minicomputer?

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The Speakers.

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FAX: 1-415-621-8038



Alexander

FROM PAGE 39

In any event, I wrote a short article about the approach of the "virus season" and then followed it up with a slightly longer one last week about a few remedies under consideration by some companies.

Other publications in both the trade and consumer press have picked up on the idea of a "virus season."

As a result, I have been inundated with calls from readers who are asking me what a way of we'll deal with through the installed base of PCs on certain days and shut down PCs across the land.

They have reason to worry—not only for the impending virus season that I first described, but also because viruses are rapidly becoming a day-in, day-out, all-year-long problem.

I have spoken to computer security experts who have been able to isolate the Datascrine virus, for example. I'm told that it appears that the virus was concocted last March 1; since then, four strains have been identi-

fied. One of the strains is set to go off Oct. 12; another is set to go off Oct. 13 or any day after.

Winn Schwartz, president of American Computer Security Industries, Inc. in Nashville, speculated that the virus may have been devised by an experienced programmer, perhaps in West Germany, and then distributed at the Galactic Hackers Conference in Amsterdam this summer. From there, it has no doubt already traveled all over the globe.

The Datascrine virus is extraordinarily destructive and venomous," Schwartz said. It attacks .COM files on a hard disk, and the only way to remove it—without an antiviral antidote—is to do a low-level format of the disk while removing all of the disk's files at the same time.

This particular virus is difficult for casual computer users to identify, Schwartz said, because it will not attack any .COM file that has the letter D as its seventh letter.

In other words, the virus has been designed to attack all but the COMMAND.COM file that is invariably in the root directory

of a hard disk. That file is often the target of various sorts of viruses; antidotes that are designed to identify and fix problems caused by most viruses are based on that premise, too. Antidotes will look at the COMMAND.COM file to see if its size has changed but not necessarily look at other .COM files on the disk.

Attacking every .COM file but COMMAND.COM is a sneaky tactic and quite effective. It is the only virus that I know of that is aimed at circumventing detection or repair by antivirus software.

It bears mentioning that there are several procedures that can be followed to protect your computer systems against computer terrorism of this sort, whether it comes in October or at any other time. Make sure that end users understand and follow procedures for safeguarding their PCs. For example, they should be barred from loading any programs onto their machines that have not been given a thorough check first. This especially applies to shareware. Vaccines, which ward off certain strains, and

Mark your calendar

The trigger dates for a variety of viruses are fast approaching, according to Eugene Spafford, a Purdue University computer scientist, and two of his colleagues. The three experts are working on a book aimed at helping end users cope with viruses and other sorts of electronic vandalism. John McAfee, president of the Computer Industry Virus Association, added that his group also believes the virus season is upon us.

Trigger dates for selected viruses are as follows:

- **August 1 1989 onwards** — Fu Manchu. Substitutes characters.
- **Oct. 12** — Datascrine. Delivers a message and corrupts hard disk format.
- **Oct. 13** — South African. Deletes files. Israeli or Jerusalem. Deletes files. Friday the 13th. Deletes files.
- **October through December** — Cascade. Displays cascade.
- **Dec. 5 onwards** — Traceback. File infection.
- **Dec. 26 onwards** — Another strain of Traceback. Displays cascade.

antidotes, which fix problems that viruses cause, can also be useful. The highest level of protection will include hardware and software that meet the federal government's data encryption standards.

I would be wary of any com-

pany that claims to have an elixir that will fix all ailments caused by viruses, however. There is no single remedy, because with each new day comes a new virus.

Alexander is a Computerworld senior editor. PCs and workstations.

Lotus

FROM PAGE 39

in the language now to do that."

A further complaint is that not only is the kit limited to Release 3.0 development, but it does not facilitate the conversion of add-ins written in C or assembly language from earlier 1-2-3 releases.

Lotus product manager Chris Smith acknowledged these limitations. Although no time frame was specified, he said the company plans to provide linking capabilities for C and assembler programs, possibly as an optional module for the kit.

Lotus is also considering support for such applications as graphics in a future release, he said.

Expectations

Despite its few limitations and the necessity of learning its development language, users contacted by Computerworld said they were eager to use the kit.

Jeff Knepper, director of advanced technology-tax at Touche Ross & Co., said he is looking forward to the security advantage that the kit provides.

Touche Ross currently develops add-in modules by writing complicated macros, which are inherently limited in functionality and difficult to secure from accidental or intentional tampering. "We've tried for the last several years to keep people out of our macros; all we can really do is make it difficult to get at them," Knepper said. Unlike macros, programs created with the kit are invisible to users.

Server

FROM PAGE 39

turned up the spotlight on throughput, response time and the number of concurrent user issues.

For example, during testing, SQL Server obtained a peak level of 10.5 transaction/sec. with five concurrent users, each generating a continuous stream of TPI transactions. When the number of simultaneous users was bumped up to 40, SQL Server's throughput dipped to 7.8 TPI transaction/sec. This compares favorably with conventional management systems, which typically exhibit a sharp drop in performance as users grow to six times.

Users seeking either a reality check or verification of these results can obtain a free SQL Server Benchmark Kit from Microsoft containing full benchmark details and a source-code disk.

An accompanying report detailing test specifications and results can be ordered from either Microsoft or Ashton-Tate.

The test was conducted during business hours on Microsoft's internal, 7,000-node, Unigen-Boss, Inc. LAN Manager Version 1.0-based Ethernet network. SQL Server Version 1.0 ran under an OS/2-based Compaq Computer Corp. 33MHz Desktop 386 outfitted with an internal 650M-byte hard disk, external 320M-byte hard disk and 10M bytes of memory. The client mix included DOS and OS/2 with varying memory and disk sizes.

Why ship OS/2 PM products?

Slow demand, lack of printer drivers stall Presentation Manager debuts

ANALYSIS

BY PATRICIA KEEFE
CW STAFF

An increasingly defensive Microsoft Corp. has taken to the offensive in an effort to still the growing chorus of critics complaining about the lack of OS/2 Presentation Manager applications. There are, of course, some PM applications available today, and Microsoft claims that many more will ship over the next year to six months.

However, some developers say they are in no rush to release their own products, citing the slow growth of OS/2.

Visionware Ltd., of Leeds, UK, for example, expects to have a PM version of Xvision, its Microsoft Windows-based server, ready early next year. "Whether we'll ship it then depends on the emergence of OS/2," said Tony Densen, Visionware's manager/director. He said that Visionware has found little demand for its other OS/2-based products, which are sold both here and in the UK.

"There are not so few OS/2 users," he said.

Jeff Leach, president of Polarsoft Corp. of Escondido, Calif., agreed. "There are not a lot of people pounding on us to get PM," he said.

The PM applications that are out are not hot sellers, according to the Aug. 15 issue of

"ACKnowledge: The Window Letter," a Mendham, N.J.-based newsletter for PM developers and users. "The reason is simple—few printer drivers," according to the publication.

Leach said that sales of a PM version of Packrat, Polarsoft's personal information manager, have been indirectly affected by the lack of printer drivers. "It's been a real problem. It's too bad the overall market is tripping over printer drivers," he said. Microsoft was caught in a situation where it contracted to write drivers for its own printer drivers written by Bauer Enterprises, which in turn subcontracted the work to another programmer, according to "ACKnowledge." Microsoft has since purchased Bauer.

Also, IBM uses a print spooler developed for PM, while Microsoft has developed a different LAN Manager print spooler. This means that third-party LAN Manager-based OS/2 servers use different printing application programming interfaces than do IBM's LAN Manager-based OS/2 LAN servers.

These issues, coupled with a lack of core applications being moved to PM, all serve to create impediments to programmers to move to OS/2, Leach said.

Yet another reason PM applications are not selling is the fact that most of the PM software shipping today is composed mostly of developer tool kits or little-known applications, ac-

cording to Nancy McSharry, an analyst with International Data Corp., market researchers based in Framingham, Mass.

Microsoft must be listening, because OS/2 Release 1.2 partially addresses these issues by adding printer support for Postscript and Epslon printers. A PCL driver is slated for release in November.

As for the paucity of applications, that situation could shortly be reversed, based on the following Microsoft estimates on the delivery schedules for a host of PM products, some from big name vendors:

- In the next three months — IBM's Officevision (this month), Lotus Development Corp.'s 1-2-3G, Borland International's Paradox, Gupta Technologies, Inc.'s SQL Windows, Ventura's Ventura Publisher and WordPerfect's and Versacard's namesakes, among others.
- In the next six months — Lotus Development Corp.'s 1-2-3G, Borland International's Paradox, Gupta Technologies, Inc.'s SQL Windows, Ventura's Ventura Publisher and WordPerfect's and Versacard's namesakes, among others.

Microsoft also ticked off OS/2 applications available today, including Interactive Image's Edsel, Borland's Sidekick, MDBS Object/1, Polarsoft's Padnet, Caseworker's Case:PM, Intelligent Environment's Applications Manager and a word processor from Describe, Inc.



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EPSON

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YOU'VE GOT A LOT OF COMPANY.*

NEW PRODUCTS

Systems

A rechargeable battery system for laptops has been introduced by Gates Energy Products, Inc.

The C 2500MAH battery reportedly features rechargeable nickel-cadmium technology in a standard C size with a 2500MAH capacity rating. The system is said to give users three to four hours of runtime and uses standard charge rates. The cost is under \$4 per cell, with OEM pricing available.

Gates Energy Products
Battery Development Dept.
P.O. Box 657850
Charlotte, NC 28266-0961
800-627-1700

AST Research, Inc. has expanded its line of AST Premium 386/25 and Premium/386C computers.

According to the company, the 25-MHz Premium 386/25 Model 1115 and the 20-MHz Premium/386C Model 3110V offer a 110M byte IBM Personal Computer AT-embedded fixed drives as well as the AST-Video Graphics Array. The 16-bit graphics adapter. The 25-MHz embedded drive provides a 16-megabyte access time and a 10M-bit transfer rate. Both systems are configured with 2M bytes of random-access memory.

The Premium 386/25 Model 1115 costs \$7,995; the Premium/386C Model 3110V costs \$6,695.

AST Research

2121 Alton Ave.

Irvine, Calif. 92714

714-863-1333

NCR Corp. has announced two desktop personal computers targeted for general-business software users.

Designed to enhance spreadsheet, database and desktop publishing applications, the NCR PC386SX and NCR PC386SX/MC are based on the Intel Corp. 32- and 16-bit 386SX microprocessor. The basic model PC386SX reportedly runs at 16 MHz and offers 1M byte of random-access memory. It is priced from \$3,195.

According to the company, the PC386SX/MC desktop system is based on IBM's Micro Channel Architecture and includes a 16-bit small computer system-based controller on fixed-disk models. A basic system retails for \$3,145.

NCR

1700 Patterson Blvd.

Dayton, Ohio 45479

513-445-5000

Toshiba America Information Systems, Inc. has announced an Intel Corp. 80386SX-based portable personal computer.

Designated the T3200SX,

the 17-pound system offers 32-bit color and a 16M-byte memory slot and a 13M-byte memory capacity.

According to the company, the product provides a platform for advanced OS/2 and Microsoft Corp. Windows/386 multitasking operating environments. It is priced at \$6,299.

Toshiba America Information Systems
9740 Irvine Blvd.
Irvine, Calif. 92718
714-583-3000

Software utilities

Telogics Technologies Corp. has introduced a menu-driven tape backup utility and archival management program.

FileSecure uses data compression to increase the capacity of each tape, decreases file-by-file backup time and was designed to support a wide variety of personal computer and backup devices.

Available now for customers using the company's QN100 technology, the utility is offered as a software upgrade to Tallgrass' installed base, the company said.

Telogics Technologies
11100 West 82nd St.
Overland Park, Kan. 66214
913-492-6002

Shortcut Software, Inc. has introduced six "personal-conversation" software products designed to address file handling and maintenance tasks without reverting to DOS commands.

Disk/Director is said to help manage files and directories. Word/Find locates any word in one or more files, while File/Find locates lost files and can list all files created in a given number of days.

According to the company, Lock/File provides password access to files. Pack/FILE saves disk space by providing data compression, and View/File enables the user to browse files without going through the original application program. Operating on Personal Computers and most compatibles, each package sells for \$24.95.

Shortcut Software

Suite M
7525 Ethel Ave.
North Hollywood, Calif.
91605
818-503-0927

Peripherals

A Tempest desktop ink-jet printer has been introduced by North Atlantic Industries, Inc.

The Deskit-T, the Tempest version of the Hewlett-Packard Co. Deskit ink-jet printer, reportedly accepts HP, desktop font cartridges, soft fonts and accessories for alphanumeric and graphic printing. According to

the company, the printer also connects with a variety of other printers, including those from IBM and Apple Computer, Inc. An option, Epson America, Inc., emulation cartridge permits use in many Epson-compatible applications.

The price is \$2,990.

North Atlantic Industries
60 Plant Ave.
Hauppauge, N.Y. 11788
516-583-6500



Output Technology's Model 2122 prints at 300 line/min.

Output Technology Corp. has announced the addition of a 300 line/min. printer to its 2100 series printer line.

Targeted at single and multi-personal computer users, the Model 2122 features built-in barcode, dot-addressable graphics, serial and parallel interfaces, multiple printer emulations and a 16-char. by two-line LCD, the company said.

The printer offers correspondence, graphics and near-letter-quality print modes, the company said. The retail price is \$3,995.

Output Technology
East 9922 Montgomery
Drive
Spokane, Wash. 99206
509-342-3855

RGB Technology has introduced an auto-ranging scan converter that converts the graphic output of the IBM Personal Computer, Personal System/2 and Apple Computer, Inc. Macintosh to television video.

The RGB/VideoLink 600 is

said to automatically synchronize with IBM's Enhanced

Graphics Adapter (300-line),

Video Graphics Array (all modes) and Macintosh II (480-line) systems.

According to RGB, the converter incorporates anti-aliasing, full 24-bit color processing and dual-line operation.

The price is less than \$10,000, the company said.

RGB Technology
2550 Ninth St.
Berkeley, Calif. 94710
415-848-0180

Facit, Inc. has added a midrange series to its line of dot matrix printers.

The B2000 series reportedly includes 9- and 24-pin printers that allow the feeding of a vari-

ety of types of paper without jamming. The 80-column B2100 and 136-column B2150 are 9-pin printers with print speeds of 240 char./sec.; their sell for \$499 and \$649, respectively. Facit, printer emulations and setups are available using Facit's optional font cards.

The price is \$2,990.

North Atlantic Industries
60 Plant Ave.
Hauppauge, N.Y. 11788
516-583-6500

Facit
University Center
900 Commercial St.
P.O. Box 9540
Manchester, N.H.
03106-9540
603-647-2700

Macintosh products

Microtech Systems, Inc. has released a 3- by 4½-in. touch-sensitive tablet that replaces the mouse for the Apple Computer, Inc. Macintosh.

According to the firm, the user slides his finger over the glass top of the Unmouse to move the cursor, pressing on the button to click the mouse button. Because the touch points are said to map directly to the pixels on the screen, the system enables the user to draw, note documents, enter signatures or trace images. Templates reportedly let the Unmouse function as a keypads for software such as Microsoft Corp.'s Word and Excel. Ordered directly from Microtouch, the price is \$235.

Microtouch Systems
53 Jonestown Road
Wilmington, Mass. 01887
508-694-9900

Archive Corp. has introduced a tape backup subsystem for Apple Computer, Inc.'s Macintosh.

The external Maxstream MS200E tape drive reportedly offers up to 2.2G bytes of storage capacity on a single standard 8mm cassette for the Macintosh IIx, SE/200, II, IIX and IICX computers. The unit can provide a rapid data transfer rate of up to 13.4M bytes/min., according to the company.

Slated for release in October, the Maxstream MS200E will retail for \$6,695 and will include a one-year warranty, the company said.

Archive
1650 Sunflower Ave.
Costa Mesa, Calif. 92626
714-941-0279

Croftfield Design Systems has introduced digital film recorder output and video camera input for its Apple Computer, Inc. Macintosh-based color layout system.

The Matrix Slidewriter re-

porter reportedly allows the user to edit and produce either 2,000 or 4,000 lines. 35mm slides when using the company's Lightspeed Color Layout System. The price is listed at \$13,750.

According to the company, the Camera Input Option allows designers to capture images in real time from a video camera. Other features are said to include a zoom lens and the ability to accept input from VHS recorders and still-frame video cameras. The video frame-grab option sells for \$12,500.

Croftfield Design Systems
65 Townsend Road
Glen Rock, N.J. 07452
201-447-5800

Software applications packages

Data analysis software for The Santa Cruz Operation's Xbase-based Intel Corp. 80386 personal computer has been introduced by SPSS, Inc.

Called SPSS-X, the software package integrates the functions of data management, file management, statistical analysis, table and chart creation, and time series forecasting. The one-time fee of \$2,000 includes 1 year of technical support and automatic upgrades.

SPSS
314 N. Michigan Ave.
Chicago, Ill. 60611
312-329-3313

Daytron Electronics, Inc. has announced computer-aided flowcharting.

Release 2.0 of TurboFlow reportedly enables the user to build his own symbol library. It can display an entire drawing, has a mouse option and produces files compatible with desktop publishing and pricing software. The program adjusts to 18 different languages and supports the use of plotters and can output up to four pages without page breaks.

The price is \$89 with a mouse and \$69 without one.

Daytron Electronics
610 S. Sherman, No. 104
Richardson, Texas 75081
214-669-2137

A software package for use with data acquisition systems in IBM Personal Computers has been presented by Preston Scientific.

Signaly provides expanded capabilities for data conditioning, analysis and display, the company said. The menu-driven software reportedly handles up to 200 data channels at a time, as many as 15 windows simultaneously and generates reports through standard word processing packages.

The basic price is \$1,500 with optional application and interface modules available.

Preston Scientific
805 E. Cerritos Ave.
Anaheim, Calif. 92805
714-776-6400

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NETWORKING

**DATA
STREAM**
Elisabeth Horwitt

At your service



When a corporation picks and holds on to a T1 vendor, the big reason seems to be good service.

Service can also mean a number of things — like when something breaks, your vendor quickly sends someone out to fix it. Avant! may have a chance at recovering from the mess it has been in for the last couple of years, because the small company has been providing good service — even while its switches have been on the fritz.

Westminster National Bank, for instance, held onto Avant!'s ONX 5000s during the last two years, even though the high-end T1 switches were apparently prone to routing glitches. Why? Because Avant! people got there first when a problem came up, and they stayed there until the problem was fixed, according to Brian Siegel, the bank's vice-president of data communications.

Westminster's communications people got access to "the people who pushed the buttons at Avant!; we got the ears of their engineers," which might not have happened at a bigger vendor, Siegel said.

Continued on page 57

Sun leads trio in RPC proposal

Standard remote procedure calls will benefit developers and users

BY PATRICIA KEEFE
CW STAFF

DALLAS — If developers take the bait, users fishing for distributed, networked applications that play across heterogeneous hardware and software platforms could find some relief within the next 12 months.

Two weeks ago, a trio of vendors led by Sun Microsystems, Inc. launched an effort to promote a standard for a transport-independent remote procedure call (RPC) said to provide a smooth migration path to Open Systems Interconnect protocols.

RPCs are used to split an application into client and server parts, shielding developers from having to deal with lower level network protocols and thus speeding up the porting process.

Sun, along with partners Netwise, Inc. and Novell, Inc., detailed plans to incorporate support for the development platform, which is called the Common Distributed Computing Platform (CDCP), in upcoming releases of specific products, including Novell's Portable Network and Netware 386.

The plan is for end users to be able to run one application that will run unmodified over multiple net-

works, then they will be more willing to port their stand-alone applications to a distributed, or client/server, environment.

"This announcement spells r-e-i-e-f for us," said Michael Prince, MIS director for Burlington Coat Factory Warehouse Corp., a discount apparel chain with 146 outlets nationwide. Burlington already uses RPC and distributed computing technology throughout its operations.

"This common platform will allow [us] to push forward with distributed applications," Prince said.

If sufficient support is generated within the industry, devel-

opers will be able to go a step further, producing distributed applications that will run across a mix of operating systems, hardware processors and transport layers.

"This effort will make it easier for Lotus and other applications developers to provide truly distributed applications [in a mixed environment]," said Frank Moss, vice-president of Lotus Development Corp.'s Networked Applications Systems Division.

A less direct impact also benefits users: No longer will they have to keep track of different network versions of an application. Retailers will also be spared that task, simplifying their investments. In turn, users may expect to be able to buy from a greater mix of shrinkwrap.

Continued on page 59

AT&T fights back, pressures FCC

ANALYSIS

BY MITCH BETTS
CW STAFF

WASHINGTON, D.C. — AT&T, using legal tactics made famous by archivist MCI Communications Corp., is applying pressure to the Federal Communications Commission to re-examine AT&T's status as a regulated "domestic" carrier.

On its face, AT&T's complaint charged that MCI has failed to file tariffs — as required by the Communications Act of 1934 — to reflect discounts provided to large customers, such as the 8.5% discount provided to Merrill Lynch & Co. a few months ago (CW, June 12).

Other unrated services were provided to Westin Hotel Co., United Airlines, the U.S. Department of Defense, the University of Colorado at Boulder. However, after months of in-

tegrating criticism of its Tariff 12 offerings to big businesses, AT&T is fighting back. Last month, AT&T filed an artfully worded, formal complaint challenging MCI's pricing strategy [CW, Aug. 14].

On its face, AT&T's complaint charged that MCI has failed to file tariffs — as required by the Communications Act of 1934 — to reflect discounts provided to large customers, such as the 8.5% discount provided to Merrill Lynch & Co. a few months ago (CW, June 12).

Other unrated services were provided to Westin Hotel Co., United Airlines, the U.S. Department of Defense, the University of Colorado at Boulder [CW, March 20], said Brian R.

and Uniguard Insurance Co., and AT&T's complaint said.

On another level, the complaint represented a criticism of the FCC's 1983 policy of classifying AT&T as a dominant carrier that must be strictly regulated and classifying others as non-dominant carriers that need little scrutiny.

In that respect, the complaint is the initial skirmish in what may be a major political battle of the 1990s — the deregulation of AT&T. Users recognize that AT&T is facing more competition than ever, but they are wary of giving AT&T any more freedom that it already has gained under the new price caps regime [CW, March 20], said Brian R.

Moir, coupled to the International Communications Association.

George R. Dellinger, a telecommunications analyst at Washington Analysis Corp., a securities research firm in Washington, D.C., reported that the AT&T complaint has two ramifications:

First, AT&T is increasing pressure on the FCC to address the looser regulatory treatment accorded nondominant carriers. Under a recently enacted law,

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Inside

- A bridge and a router. Page 53.
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Finding a brouter that does it all

Laclede Gas meets net demands with Halley's Connectlan 100

ON SITE

BY JOANIE M. WEXLER
CW STAFF

ST. LOUIS — When Laclede Gas decided to integrate its four Ethernet local-area networks with T1 links nearly a year ago, it had a few specific demands for the bridging product it would select.

First, the company needed the protocol independence of a bridge because it had future plans to implement Transmission Control Protocol/Internet Protocol across its network but was still using the Xerox Net-works server protocols.

"We wanted to make sure we didn't run into any compatibility problems down the road," explained Laclede's superintendent of computer applications, Harry Haury.

At the same time, the company desired more intelligent router functions, such as distributed load sharing and source and destination filtering for enhanced security. Laclede also wanted a product that was based on an industry-standard platform, ac-

cording to Haury.

The company chose Connectlan 100, produced by Halley Systems, Inc., which are made by RAD Network Devices.

A T1 line with three of the brouters was installed in the company's home office last year. From those brouters, Laclede connected T1 links to three remote stations.

The load-sharing feature, Haury said, benefits the company because as the data traffic shifts, the brouters dynamically allocate bandwidth, which "provides us with optimum performance."

More control

The source and destination filtering feature allows the definition of access levels for each node. "We can specify, for example, that node two cannot access node 16," explained Haury. At the time that Laclede conducted its evaluation of bridging products — from Bridge Communications, Inc., Crosscom Corp., Halley, Raycom Systems, Inc. and Vitalink Communications Corp. — "quite a few of the vendors supported destination fil-

tering, but none besides Halley supported source filtering, as well," Haury said.

The Halley product is based on an IBM Personal Computer



Laclede's Haury gets optimal performance with Connectlan

AT with a T1 interface card, allowing Laclede to "maintain a lot of the computer system ourselves."

Haury justified the brouter selection, noting that "we got a highly functional brouter for about the cost of a bridge; the

product's cost/performance ratio was far better than anyone else's at the time." The brouter ranges in price from \$9,000 to \$14,000, depending on the number of links supported and options selected, according to Halley.

The product, Haury added, was "extremely easy to install and was user-transparent. We haven't had so much as a hiccup with it." Haury acknowledged that "we wish the product had better hooks into the CSU/DSU [channel service unit/digital service unit] for running diagnostics across the network. Right now, we're unable to diagnose a failure in a link."

To that end, the vendor is currently offering Connectview, a network management system running Microsoft Corp.'s Windows that was developed last May to monitor the brouters.

"The system will sound an audible alarm, so you don't have to be sitting in front of the station," said Venant Acharya, Halley's product marketing manager for the Connectlan 100. "Laclede isn't using the product at this time, but it would solve the problem of monitoring the T1 link. We are currently working on providing hooks into the CSU/DSU, but we don't have a timetable for completing that yet."

"Connectview is very good," Haury responded, "but it doesn't handle communications with the CSU/DSU for loop-back testing. For us, with a fairly simple, point-to-point network, the system isn't worth the cost [\$10,000]. Connectview would be better suited in a more complex network."

Acharya added that a custom filtering mask, also new to the brouter since the Halley implementation, "allows all bad traffic to run on link A and interactive traffic to run on link B, so the interactive traffic doesn't experience delays," he said. The T1 network now handles all Laclede's applications. For example, in order to improve customer service, the company installed a system to track gas connections. "The system required enough bandwidth for exchanging large files, such as engineering drawings, between remote and local sites and for distributed database sharing among the four locations."

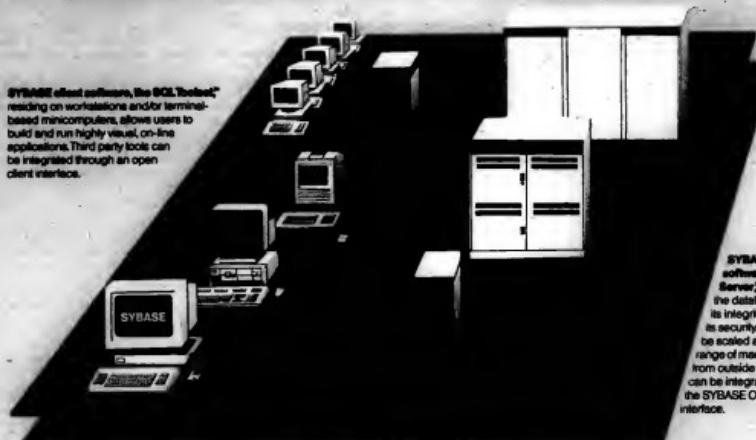
Previously, the local and remote sites were linked by a 3Com Corp. 3+ remote ASCII interface and 9.6K bit/sec. modems, which accommodated batch file transfer and did not allow remote users to use the database interactively in the same manner that local users could.



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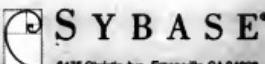
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Plans, not products, highlighted in major vendors' Network pitches

BY CHARLES VON SIMSON
CW STAFF

DALLAS — Although short on deliverables, major vendors were quietly stumping in the wake of Network '89 for product developments that they say will add significantly to their competitive positioning within the next 12 months.

Digital Equipment Corp. and Motorola, Inc., announced that the latter company would market several DEC chip designs based on Fiber Distributed Data Interface (FDDI) standards for 100M bit/sec. network communications as well as several of its own designs. The new chips are slated to be available in 1990.

"We have worked with them on the design and will announce a block of FDDI bridge products based on the chip within the next year," a DEC FDDI marketing manager said. "We expect they will be among the first FDDI products on the market."

DEC will get the first shipment of the chips, but several other communications vendors have also expressed early interest, Motorola sources said.

Current FDDI products are based on chips by Advanced Micro Devices, Inc., a Sunnyvale, Calif., chip manufacturer. The market for the chips is currently confined to small evaluation samples being used by

device manufacturers.

Analysts said that while the FDDI market showed promise, mature end-user demand was two to three years away. As prices drop, the technology will become increasingly cost-effective for high-speed backbone applications. Desk-to-desk communications will benefit as well, as advanced workstations requiring increased speed and bandwidth proliferate.

Oracle Corp. officials said the company's newly formed network products division will immediately begin to market an unversioned version of the company's SQL Net, a remote procedure call software system that has been a separately priced part of Oracle's relational database management system.

It is also likely that the company will enter the network management system market within the next two years, according to Donald "Smokey" Wallace, vice-president of the division.

If the company continues with that plan, it will face growing barriers to entry in the next several years. "The credibility and installed base of vendors already in the market are already large," said Cecilia Brancato, network analyst at Oppenheimer Co. in New York. "And the technology is moving fast enough that if Oracle is planning for today's environment, they might end up missing the boat."

AT&T

CONTINUED FROM PAGE 49

the FCC must respond to the complaint within one year.

Secondly, AT&T may be trying to force MCI and other competitors to adhere to their published tariffs, thus reducing their ability to strike secret, off-tariff deals. AT&T's special deals must be disclosed in publicly available tariffs, so the discount rate quickly becomes the standard requested by other customers.

AT&T "wants to point out that MCI can change its prices without FCC investigation, whereas AT&T, if it happens, gets investigated by the FCC," said Alan Pearce, president of Information Age Economics, Inc., a telecommunications research firm in Bethesda, Md.

An MCI spokesman acknowledged that MCI does not file tariffs on custom services provided under contract, but denied that MCI has done anything improper. She said the complainant "really is just a smoke screen to help AT&T achieve their own deregulation."

The AT&T complaint, in essence, challenges the FCC's 1983 "forbearance doctrine." It holds that nondominant carriers need not file tariffs nor seek FCC permission to offer services.

Now, AT&T is arguing that the forbearance doctrine is fundamentally inconsistent with the Communications Act, which holds that all carriers must file tariffs regardless of their market power and that the rates must be reasonable and

nondiscriminatory. "MCI and other competitors have gained unwarranted advantages in the marketplace by selectively providing services on an off-tariff basis," AT&T charged.

When MCI keeps the transaction secret by avoiding a published tariff, AT&T has little information on which to base a competitive bid, according to a report by Valuecom, Inc., a telecommunications consulting firm in Vienna, Va.

On a separate track, Pearce said he anticipates that the FCC will launch a proceeding to re-evaluate AT&T's regulatory status. "I think it's inevitable. AT&T wants it . . . and I have no doubt that a majority of the current commissioners want it," he said. "The Notice of Inquiry will be biased in favor of deregulation, because most of the commissioners are in favor of deregulation."

However, any move toward further deregulation of AT&T is likely to anger members of Congress, who at a time when FCC Chairman Alfred C. Silberberg vowed to keep peace with Capitol Hill.

Users are eager for the FCC to conduct an unbiased, comprehensive study of the economic and technical characteristics of the interexchange market, said Richard A. Fazzino, telecommunications affairs manager at GE Information Services, a unit of General Electric Co. in Rockville, Md.

However, he cautioned: "Many users have been critical of the regulatory process in recent years when the conclusion is reached [first], and then they start looking for facts to justify it."



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TO A.J. Chandler
FROM M. Penning
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BIT BLAST

OSI forum picks new head

The OSI/Network Management Forum recently elected British Telecom's Keith J. Willetts to succeed AT&T's John A. Miller as president. Willetts, who heads British Telecom's managed communications systems unit, served as vice-president and technical director during the forum's first year.

U.S. Sprint Communications Co. fired another shot in the T1 rates war recently, announcing that it will reduce rates for its Clearline 1.5 private T1 service up to 28%, effective Nov. 1. "We're just trying to maintain our price lead," a company spokesman said.

The Electronic Data Interchange (EDI) Association in Alexandria, Va., has begun an independent study to analyze the potential impact on U.S. users of the United Nations' international EDI standard. The study, which will include extensive user in-

terviews, will be conducted by Mountain View, Calif., research firm Input and will be presented at the 21st National EDI Systems Conference and Exhibit in Washington, D.C., in December.

Digital Communications Associates, Inc. announced recently that it has become the first independent Digital Equipment Corp.'s Local Area Transport specifications. DEC recently announced that it would license the proprietary protocol to other vendors, making it easier for non-DEC terminal servers to access DEC hosts, and for non-DEC hosts to become accessible via the protocol.

AT&T filed two more Tariff 12 contracts recently: a \$40 million contract with Allied-Signal, Inc., and a five-year contract, valued at up to \$100 million, to upgrade Unisys Corp.'s internal digital network. Unisys expects to save \$12 million annually as a result of the upgrade.

Horwitt

FROM PAGE 49

It would have happened at NET, though, industry sources claim. NET holds about one quarter of the T1 market, and its revenue continues to skyrocket, because the company convinced its investors to spend more than \$11 million up front on service alone, according to *Total Customer Service: The Ultimate Weapon*, a recently published book by William H. Davidson and Bro Ultal. NET gets problems like those just fixed within two hours after the customer calls in a complaint, which gives the vendor great word-of-mouth referrals, the book states.

Good service is also important before the actual sale, when the customer is trying to figure out how to optimize a complex network in terms of cost, reliability and response time. Several T1 vendors have been tailoring network design packages from companies such as Make & Quintessential and either selling the software to the user or giving it to their salespeople as a value-added service. NET, for example, sells Make's package and sends it out with salespeople to help generate proposals for customers. The

package is clearly an effective sales tool because it "gives customers confidence that the network will have the level of performance they require," a NET spokeswoman said.

NET's version of the product just handles T1 switches right now, but plans are in the works to extend the tool to handle packet-switching and multiplexer equipment from NET subsidiary Comdesign, as well as LAN bridges and routers from NET partner Cisco, the NET spokeswoman said.

Infotron went a step further, recently announcing a free consulting service that recommends the best configurations of networking equipment for the customer without specifically recommending Infotron equipment. Of course, the consultants talk about products that Infotron happens to sell — like fractional T1, multiplexers and LAN bridges — but they also have specialists in carrier-based services. "Free" consulting is their edge for establishing good will with accounts that may already have somebody else's equipment, an Infotron spokesman said. Hey, it could work.

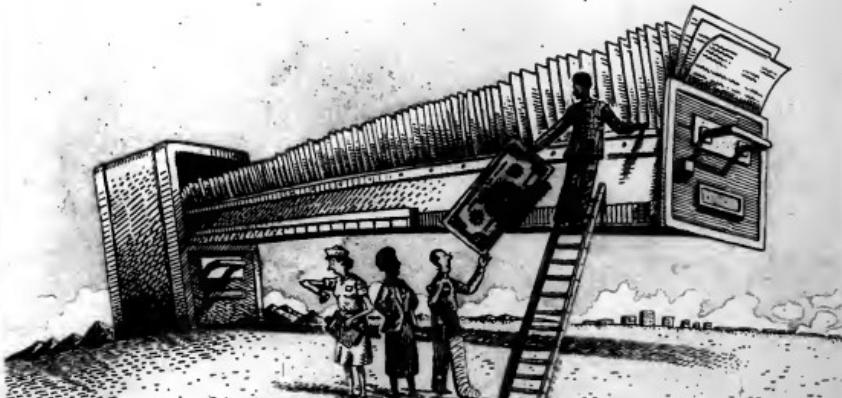
Lack of good service — before and after the sale — may be one reason why Cohesive, once

considered one of the hottest T1 vendors around, is apparently about to be put on the block. DCA bought the company to round out its telecommunications product line but apparently has not put enough resources into leveraging Cohesive's technology with good marketing and support. DCA sells Ima boards that link terminals to hosts; T1 switches are a sideline to the vendor, and users apparently got that message. Nobody survives today's T1 market without full product line commitment.

We're at that very hairy stage in the telecommunications game when the rules keep changing, and technical experts everywhere are wondering what's going on, and standards may or may not be establishing themselves. Thus, it is harder for communications managers to make effective buying and configuration decisions.

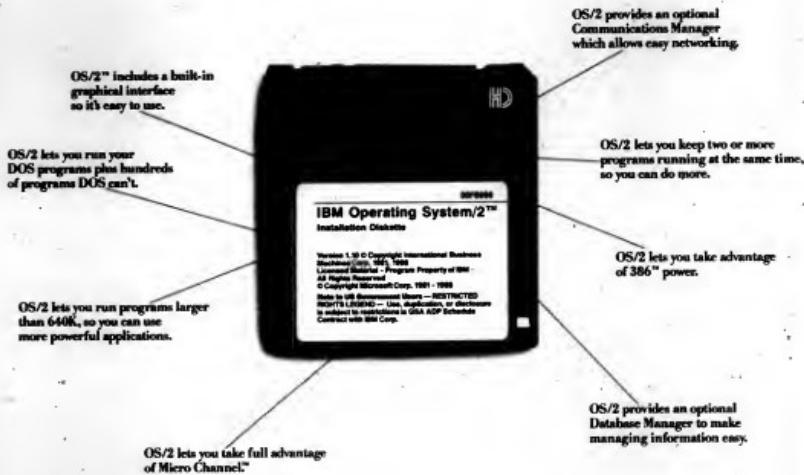
So, vendors whose sales and support people can give the user useful, semi-disinterested (well, semi-semi-disinterested) advice on how to put the right mix of products and services into an effective network will be more than welcome — and successful.

Horwitt is *Computerworld's* senior editor, networking.



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IBM

Prodigy blows into the Windy City

BY ELLIS BOOKER
CW STAFF

CHICAGO — Prodigy, the on-line information service from IBM and Sears, Roebuck and Co., came last week with high hopes of luring some of this city's estimated 375,500 households with personal computers into the information age.

Chicago is the latest city to be added to the Prodigy Services Co. network, which brought its first users on-line last October and now claims approximately 85,000 households — which may include up to six users each — in suburban areas in 30 U.S. cities. Dallas and Fort Worth, Texas, are slated to join the network, according to the company.

"Prodigy has added between 125,000 and 140,000 subscribers since October, and that has to be the quickest acquisition of subscribers on record," said Bernell Wright, vice-president of the electronic communications practice at Link Resources Corp. in New York.

Wright adds he believes Prodigy is ahead of its projections for attracting advertisers, a traditionally difficult feat for new forms of mass media.

However, Wright believes the service will need "millions" of subscribers to justify what Link figures say has been a \$50 million (million) or \$600 million investment to date. "They may have to invest up to \$1 billion to make it go," he said, adding that a benchmark for the service will be whether it can "cross the million subscriber market within 18 months."

Household feed

According to Link figures, the number of households subscribing to videotex will grow from 1.3 million this year to 4.8 million by 1993. However, Link figures also show that the number of households using PCs and modems will grow from 7.1 million this year to 17.8 million by 1993 — proving that a modem does not a videotex user make.

Currently, Compuserve, Inc., an H&R Block subsidiary in Columbus, Ohio, is the nation's largest videotex provider, with around 540,000 subscribers. Prodigy officials, meanwhile, step gingerly over the bodies of such failed videotex ventures as Knight-Ridder, Inc.'s \$50 million-plus Viewtron videotext service.

Among other encouraging trends, Prodigy officials cite the dropping prices of PCs, better compatibility with the PC, and the thirst of busy business for information and services.

Pricing for Prodigy is fixed at \$9.95 per month, plus local telephone connection charges. Using 1.2K bit/sec. or 2.4K bit/sec. modems, an IBM-compatible PC with 512K bytes of memory, users have access to approximately 700 information services, including electronic mail, online investing, shopping and news.

Unlike text-based on-line information services, Prodigy employs the North America's Precision Level Protocol System (NAPLPS), for its graphical user interface.

While NAPLPS adds a free face to on-line service and can portray a graphical representation of the camera that the consumer is thinking about buying through the Sears' on-line catalog, the speed of the service is appreciably slower than text-based services.

However, Prodigy's architecture employs the subscriber's PC to process and store many images and thus improves response time.

Sun

FROM PAGE 49

wrapped distributed applications.

The CDCP championed by the triumvirate and 20 other backroom players at Novell will see 3Com, Compaq, Bechtel Systems, Inc. — an amalgamation of several pieces: Support for Novell's RPCs and Sun's RPC library and extended data representation protocols, a Unix System 4 Transport Layer Interface co-developed by Sun and AT&T and a new release of Netwise's RPC Tool compiler, which is slated to ship early next year. A CDCP developer's tool kit will be offered in the first half of 1990.

Despite the swarm of support, the Sun platform is neither unique nor the first to be proposed. Sun's proposed RPCs will compete with an RPC invented by Digital Equipment Corp. and Apollo Computer, now a division of Hewlett-Packard Co. That RPC is derived from Apollo's Network Computing System, which numbers DEC and IBM among its many licensees. Both groups have offered their respective RPCs to the Open Software Foundation (OSF) as a standard.

Neither the Sun nor Apollo/DEC RPCs compete with OS/2 LAN Manager's Named Pipes interprocess communications, according to spokesmen from Sun, Microsoft Corp. and Oracle Corp. Actually, both would-be RPCs run on top of Named Pipes, several backers of the Sun RPC proposal explained.

Supporting cast

In all, 20 developers, along with Burlington Coat, turned out to hail Sun's RPC effort as a "breakthrough." Developers such as Ashton-Tate Corp. and Oracle Corp. added their voice to Lotus', expressing enthusiasm for the would-be RPC standard.

Yet several developers indicated that they are willing to support two RPCs. As one developer pragmatically put it, "Supporting two RPCs is a lot better than supporting multiple standards."

Castigating a slight pill over the announcement was the absence of IBM and Microsoft. Efforts to reach IBM for comment were unsuccessful. A somewhat cryptic Mike Murray, Microsoft's marketing director of its networking business, would only say that Microsoft's position will become clear once OSF makes its decision, which some observers say will be next month.

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NEW PRODUCTS

Local-area networking hardware

Xerox Corp. has announced the Xerox Encryption Unit, an electronic encryption device that allows government computer users to send and receive classified and unclassified messages on the same local-area network.

The product was designed to protect information transmitted over LANs that meet IEEE 802.3 and Ethernet standards, the company said. The device is installed between a workstation or a personal computer and a network con-

nexion. It measures 3 by 10 by 12 in. and can sit atop a Xerox 6085 workstation processor.

The unit sells for \$4,995.

Xerox

P.O. Box 1600
Stamford, Conn. 06904
203-329-8700

Racial-Interlan, Inc. has announced the NIH510, a 16-bit Ethernet network controller targeted for performance-sensitive networks that use Novell, Inc. Netware workstations and servers.

The product reportedly includes an externally mounted switch that allows users

to quickly configure the controller to run IBM Personal Computer AT-based Netware systems on thick or thin Ethernet. The product works with most AT-compatible computers based on Intel Corp.'s 80286 or 80386 microprocessor.

It costs \$495 and volume discounts are available.

Racial-Interlan
155 Swanston Road
Boxboro, Mass. 01719
508-263-9929

DNA Networks, Inc. has announced two local-area network environments targeted at users with multivendor configurations.

DNA Meganet offers support for eight to 256 nodes and operates at 10M bit/

sec., according to the vendor. It is said to provide NetBios compatibility and can access any printer, modem or facsimile that resides on the network.

DNA Micronet supports as many as 64 users and operates at 2M bit/sec. line speed. Both systems reportedly integrate with IBM Personal Computers and compatibles running MS-DOS 3.1 or higher.

DNA Meganet's retail pricing starts at \$695 for the master board and \$395 for each workstation board. DNA Micronet is priced at \$345 per user-unit.

DNA
351 Phoenixville Pike
Malvern, Pa. 19355
800-999-3622

Local-area networking software

Excelan, Inc. has announced a Transmission Control Protocol/Internet Protocol networking software product for desktop computers running the OS/2 operating system.

Called LAN Workplace for OS/2, it is said to be both hardware- and media-independent and can operate over all Ethernet and Token-Ring implementations. The software resides in memory-access memory and can be used with any standard personal computer networking interface controller that supports the Network Device Interface Specification standard, the company said.

The product is priced at \$495 per node and is scheduled for release in the fourth quarter.

Excelan
2180 Fortune Drive
San Jose, Calif. 95131
408-473-2300

The Softbridge Group has upgraded its Bridge software integration products, reportedly designed to connect multiple off-the-shelf and custom Microsoft Corp. Windows and DOS applications under a common graphical interface of menus, icons and dialogue boxes.

Versions 1.1 of the Bridge Tool Kit, Bridge/286 and Bridge/386 are said to feature upgraded dialogue box data validation, dialogue boxes that terminate with a timer rather than a push button, a browser and trace function and a bit-map capability that permits screen captures of other applications.

The Bridge Tool Kit sells for \$695, and run-time licenses of Bridge/286 and Bridge/386 start at \$125 per unit. The upgrade is free and will be mailed to Bridge users.

Softbridge
125 Cambridgepark Drive
Cambridge, Mass. 02140
617-576-2257

Network management

Hewlett-Packard Co. has announced HP Glance, a performance-management software tool developed to bring on-line interactive resource monitoring to HP 3000 business computer users.

The software reportedly permits the user to monitor memory management, CPU utilization and disk I/O activity. It runs on a standard HP terminal connected to the HP 3000 system.

The product is priced from \$600.

HP
3000 Hanover St.
Palo Alto, Calif. 94304
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The 4174 11L supports 64 coax and 24 ASCII devices plus a token ring.

have gone by many names, sold under private label to widely known vendors.

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McDATA raises network communications to a new plane of efficiency, going beyond plug-compatibility to a sophistication in connectivity which represents a value in itself, not just a workaday necessity.

For example, for bulk file transfers between hosts, the LinkMaster 6100C network processor allows files on a host to be sent quickly and effectively to not just one, but multiple hosts in multiple locations.



The 6100C network processor utilizes existing channel connections for direct NetView interface.



Using the LinkMaster 5000 series of channel extenders, disaster recovery backup tapes can be made offsite whenever they are needed, eliminating the time and expense of manual tape transportation.



The 5000 series of channel extenders can be installed in less than one hour.

LinkMaster 4174 controllers interconnect 3270 terminals, ASCII terminals and PCs to multiple hosts, either DEC or IBM. And LinkMaster products enhance network management with direct NetView interface.

These are just a few highlight examples of McDATA's LinkMaster network solutions at work.

LinkMaster goes beyond compatibility to the next stage of the network communications evolution, a comprehensive multivendor connectivity which, in high-speed, long-distance channel communications, represents the next significant horizon to be crossed.

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DATA

Customer-premises equipment

Scientific-Atlanta, Inc. has announced a T1 product created to broadcast data over satellites.

The Model 4580 uses very small-aperture terminal (VSAT) technology to distribute data, video, voice and audio from a centralized facility to a widely dispersed network of remote locations, the vendor said. The device may be configured for operation up to 1.5M bit/sec. or 2M bit/sec., and can be used for either stand-alone broadcast data applications or as part of an integrated VSAT-based data communications system.

The product is priced from \$3,000 to

\$5,000, depending on network configuration.

Scientific-Atlanta
Box 105600
1 Technology Pkwy.
Atlanta, Ga. 30348
404-441-4000

Links

Data Switch Corp. has announced a channel extender designed to enable IBM 3090 mainframes and compatible computers to communicate with direct-access storage device disks at distances up to 1,300 feet.

The Model 9390 is said to be software-transparent to both the computer and control unit channels and uses shielded

twisted-pair cable to connect a pair of extender units. The product is priced at \$19,800, and a monthly rental program is available.

Data Switch
1 Enterprise Drive
Shelton, Conn. 06484
203-926-1801

Electronic mail

An electronic-mail network developed for small and medium-scale businesses requiring international communications capabilities has been announced by Globalnet, Inc.

The Globalnet Electronic Mail System (GEMS) is a value-added network service for transmitting memos, newsletters and

written materials worldwide. GEMS is capable of carrying binary files such as spreadsheets and databases and allows messages to be printed, resent or saved as a personal computer file. Subscribers must be equipped with a personal computer and a standard modem.

Pricing for the product varies with customer usage and configuration, with discounts available for multiple-address messages.

Globalnet
10 Madison Ave.
New York, N.Y. 10017
212-929-8880

Modems

Best Data Products, Inc. has announced Smart One 4824SF, a 2.4K bit/sec. data modem with facsimile capabilities.

The device incorporates a G3-compatible fax operating mode for transmitting graphics, ASCII files and documents from the user's IBM Personal Computer or compatible to fax-capable machines. It reportedly can transmit graphics in a bit-mapped format. It sells for less than \$200.

Best Data Products
5907 Noble Ave.
Van Nuys, Calif. 91411
818-786-2884

Gateways, bridges, routers

A second-generation, full-bandwidth bridge has been announced by Cross Comm Corp.

The High Speed Bridge Ethernet-to-Ethernet bridge was designed to match the maximum traffic requirements possible on any Ethernet local-area network. It comes equipped with network management functions, Spanning Tree Protocol and IEEE 802.1 compliance. The bridge is priced at \$3,450 in unit quantities.

Cross Comm
P.O. Box 699
Marlboro, Mass. 01752
508-481-4060

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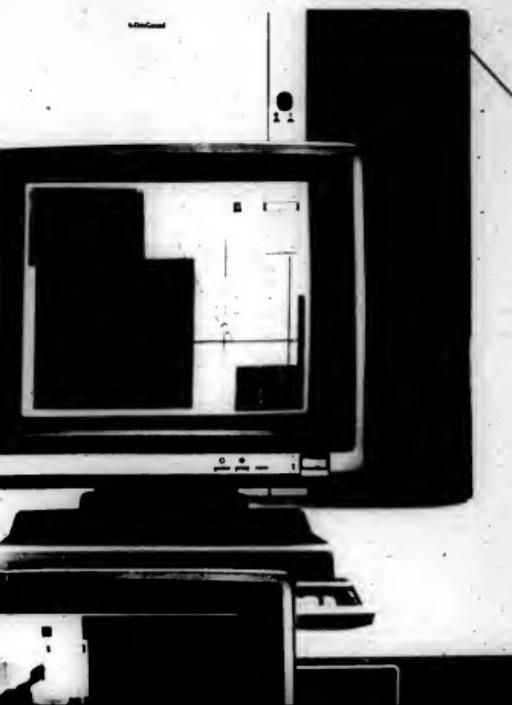
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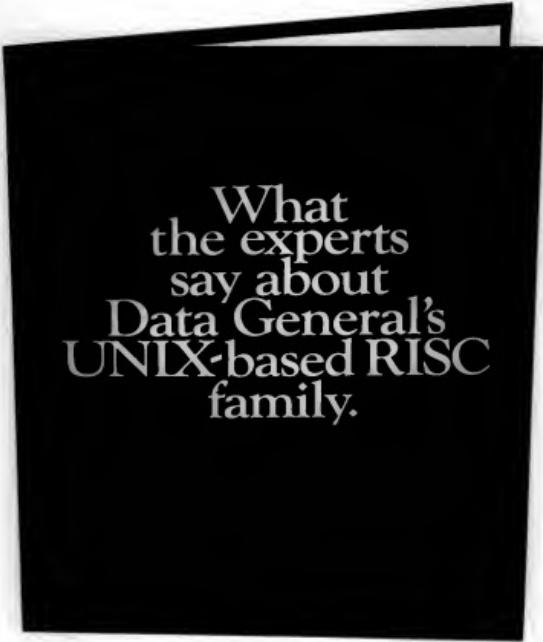
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MANAGER'S JOURNAL

EXECUTIVE TRACK

R. Mark Bentley has joined Iron Mountain, a Boston-based records management company, as director of management information systems. He is responsible for the design and support of all information systems and reports to Iron Mountain President Richard Rose.

Bentley was formerly MIS manager at Alpha Industries in Woburn, Mass. Before that, he was a management consultant at Grant Thornton in New York.

Bentley holds a bachelor's degree from the University of Massachusetts at Amherst and an MBA from the Wharton School of business at the University of Pennsylvania.

Iron Mountain is the U.S.' largest records management firm, storing more than 13 million cubic feet of business records.

Stephen Long has been named director of computer resources at Hawthorne/Wolfe, Inc., a St. Louis-based communications firm. Long, who was previously the department manager for desktop services at The Composing Room in St. Louis, will be responsible for computerized design and typesetting at Hawthorne/Wolfe.

Christos Jason Moshcovitis, former vice-president and chief information officer of The O'Conor Group, has founded Christos Moshcovitis & Associates. The Brooklyn, N.Y.-based firm is an IS consulting organization focusing on strategic planning, systems integration and networking and applications development.

Who's on the go?

Changing job? Promoting an assistant? Your peers want to know who is coming and going, and *Computerworld* wants to help by mentioning any IS job changes in Executive Track. When you have news about staff changes, be sure to drop a note and photo or have your public relations department write to Clinton Wilder, Senior Editor, Management, Computerworld, Box 9171, 375 Concourse Road, Framingham, Mass. 01701-9171.

Shhh! Don't talk tech at Cadbury

Innovative technique requires developers to learn the business first

BY RICHARD PASTORE
CW STAFF

For at least a couple of months during his employment, a systems developer at Cadbury Schweppes, Inc. will be forbidden to say the words "personal computer," "mainframe," and "software." Instead, he may talk about how apples are unloaded from trucks, sorted and pressed into juice or sauce at a factory of Cadbury subsidiary Mott's USA.

That developer is conducting what Cadbury calls a business review, an innovative management technique that the world's third-largest beverage company uses to assimilate its many acquisitions with a minimum of technological hiccup.

The review — intended to identify business problem areas and then recommend technological solutions — is a concoction of Chief Information Officer Joe Nash. Nash oversees information systems for all of Cadbury Schweppes' North American subsidiaries from a ginger ale-tinted headquarters building in Stamford, Conn.

"The people in MIS, who all have good business backgrounds as well as technical backgrounds, go into the business and review how [business managers] do their work," Nash explains. "They look at flow of information and how tasks are done. They sit down with user management and go out into the field to take customer calls with the salesmen."

At no time during the initial review can the IS staffers talk technology. "It's really taboo," Nash says. Once problem areas are identified that could benefit from some sort of automation, "only then do we allow our people to say things like 'PCs' and 'software.'



Cadbury's Nash gets IS and business staff together

One business manager, Mott's Director of Marketing Frank DeLeo, admits he was surprised by the concept at first. But after seeing it in action, "it struck me as a very logical way of getting at our needs and how to address them," he says. "They walk in untrained and walk out trained and without a [preconceived] solution."

Nash's staff helped identify the need to better manage Mott's marketing data and recommended a new marketing analysis system. "It was a joint project — we worked together to find

the right solution," DeLeo says.

Besides Mott's, Cadbury's other major acquisitions have included Canada Dry Corp., and, more recently, Crush International. Cadbury integrates its acquisitions technically by porting its financial applications to the IBM 3081 Model K mainframe in Cadbury's Naugatuck, Conn., data center.

At the same time, Cadbury converts the acquisition's internal applications, including word processing and payroll, to standardized packages that run in

Continued on page 66

Two-in-one facility a dream come true

BY MITCH BETTS
CW STAFF

The management philosophy at MCI Communications Corp. stresses that data processing and network operations should be virtually seamless. In a move that makes that philosophy very concrete, MCI has opened a facility in North Royalton, Ohio, that combines a highly automated data center and a network operations center.

The combined facility is the first of its kind in the telecommunications industry, according to Frank J. Koss Jr., MCI's senior vice-president of network construction and administration.

Allen Ditchfield, senior vice-president of MIS, says colocation reduces costs because the operations can share the facility's security, fire-suppression and environmental systems. In addition, he said, only one set of managers is needed to oversee the combined center, and construction costs are reduced.

At the newly expanded North Royalton Operations Center, the data center takes up about half of the 160,000-sq.-ft. facility. The data center has two IBM 3090 Model 6005 computers — with two more to be added next year — that handle billing, order entry and order processing for MCI customers in a 14-state area. The network operations

center controls switching and transmission for a large percentage of the voice, data and image traffic on MCI's network, which carries more than one million calls per hour.

Koss said the center is one of the most highly automated in the telecommunications industry. Four robotic tape-storage sites feed tapes into the computers once every 23 seconds — a process that would take between one and seven minutes to accomplish manually. Furthermore, the center is remotely controlled from MCI's National Network Management Control Center in Reston, Va.

Because the center has a combination of human managers and robots, however, Ditchfield refers to it as a "darkened" data center rather than a "lights out" data center.

MCI

Black execs 'network' at BDPA gathering

ANALYSIS

BY JEAN S. BOZMAN
CN STAFF

LOS ANGELES — The seminar topics were the usual for an information-processing conference. The subjects were IBM's DB2, AT&T's Integrated Services Digital Network technology and artificial intelligence. But the audience looked distinctly different from those attending most IS meetings — nearly everyone in the audience was black.

The occasion earlier this month was the eleventh annual meeting of the Black Data Pro-

cessing Associates (BDPA) conference, an event that drew 200 of the nonprofit association's 1,100 members. What drew them across the country, many traveling at their own expense?

"One member put it this way: 'We didn't come here to network, we came here to excel for not working harder and progressing in my chosen field,'" said Margaret Jennings of Washington, D.C.

"And racism is not going away."

Many BDPA members said that, during careers spanning 10 to 20 years in the IS field, they have hit a "glass ceiling" preventing further promotions. BDPA was formed to help prevent the isolation of a dead-end

career caused by discrimination and to provide a growth path through networking with other IS practitioners.

The keys to networking are the members' business cards, which read like a directory of corporate America. There are members from Ford Motor Co., Electronic Data Systems Corp., MCI Communications Corp., IBM, Digital Equipment Corp. and Federal Express Corp.

BDPA membership does not consist of people who are not working hard and progressing in my chosen field," said Margaret Jennings of Washington, D.C. Despite the many locations, it has only 1,100 members. Growth has been hampered by its all-volunteer organization and lack of an executive director and official headquarters, BDPA organizers acknowledged.

According to its mission statement, BDPA has the following purpose: to support individuals pursuing information pro-

cessing as a career or entrepreneurial opportunity; to provide a forum to develop IS-related skills; to enhance the understanding and utilization of information processing within the minority community; and to join with other IS-related organizations to support common goals.

But progress has been more on a person-to-person level than on an organizational level. Thirteen years after its founding in Philadelphia, BDPA has 34 chapters spread across the country, mostly in large cities in Los Angeles, Chicago, Atlanta, Detroit, New York, Philadelphia and Washington, D.C. Despite the many locations, it has only 1,100 members. Growth has been hampered by its all-volunteer organization and lack of an executive director and official headquarters, BDPA organizers acknowledged.

Even if it had 2,000 members, BDPA would be far smaller than the 40,000-member Data Processing Management Association. But Chet Holmes, program chair for the Los Angeles BDPA convention did not rule out additional membership of 5,000 or more by the year 1990. A survey by the Los Angeles chapter, which has 100 members, indicated that there is a potential audience of 15,000 black IS professionals within 50 miles of downtown Los Angeles, Holmes said.

BDPA President Vivian C. Wilson, an Oracle products manager in Cleveland, said there will be a national push this year for new members. "Our agenda is to promote and to publicize," she said. "By this time next year, I would like to have 2,000 members who are intensely involved in the DP field."

To encourage young people to enter the DP field, the BDPA

sponsors an annual computer competition involving high school-age teams. This year, there were 40 contestants from eight cities; the seven listed above plus Memphis.

The competition, held Sept. 15, used queuing theory to ana-

RACISM IS NOT an excuse for not moving ahead and progressing in my chosen field."

MARGARET JENNINGS
BDPA MEMBER

Cadbury

FROM PAGE 65

IBM mainframe MVS and Personal Computer environments. But in many cases, standard packages are not appropriate, and operations may not even be automated. That is where the business review comes in.

An IS-led business review is not unique as a concept, but it is innovative in practice. "While a lot of companies give that approach lip service, our experience is that not as many people actually do it," observes Joe Dunn, a Coopers & Lybrand consultant, who conducts such reviews for clients.

For most of the staff, the review approach required attitude adjustments. "It was a bit difficult at first because MIS people traditionally go in with a technol-

ogy idea and say, 'Oh, I can do these wonderful things,' without understanding the fundamentals of the business," he says. But the staff quickly moved up to the task, Nash says.

Cadbury's first business review arose from a frustrating systems-planning discussion that took place two years ago between Nash and executives of the company's Schweppes unit. Nash called a halt to the talks and suggested starting over by taking a good look at the business operations.

"We sent people out there for two months," Nash recalls. "They went out in the field, made calls on bottlers. Upon return, they identified specific problems, including a weakness in sales force productivity — something the Schweppes president later admitted always

concerned him, Nash says.

The suggested IS solution was to arm the sales force with laptop computers. It began by involving several salespeople, and since then, the entire national sales force has adopted the laptops. The result after a year has been a 20% rise in productivity.

"It worked out terrific. They were making more bottle calls instead of doing all this administrative paperwork," Nash says. The salespeople use the machines to do presentations to bottlers, using packages such as Software Publishing, Inc.'s Harvard graphics.

At the latest national sales meeting, according to Nash, most of the sales team hooked their PCs to overhead screens to run their meeting presentations. And they were wearing "I love my laptop" buttons.

Service Level Management Seminar, Los Angeles, Oct. 9-4 — Contact: IBM, Communication Conference Coordinator, The Flair, 1745 Jefferson Dr., Arlingtton, Va. 22205.

Computer Facility Planning and Operations, Los Angeles, Oct. 2-3 — Contact: Education Extension, George Institute Of Technology, Atlanta, Ga. 30332.

Electronic Imaging Conference West, Seattle, Oct. 2-5 — Contact: MG Exposition Group, 1200 Commonwealth Ave., Boston, Mass. 02115.

Electronic Industries Association Convention, Anaheim, Oct. 2-5 — Contact: Electronic Industries Association, 2001 1 St. N.W., Washington, D.C. 20006.

Europe 1992, Nov. 10-12 — Contact: Novellus Systems, Inc., 1000 Corporate Center Dr., San Jose, Calif. 95131. Tel: 408/432-1000.

Georgia 1992 International Home Show, Duluth, Ga., Oct. 1-4 — Contact: Georgia Home Show, C.R.C. 9400 Roswell Rd., Atlanta, Ga. 30339.

The National Communications Forum, Oct. 2-4 — Contact: Professional Education Services, Suite 300, 200 East Walker Drive, Chicago, Ill. 60601.

Open Systems Conference, San Francisco, Oct. 2-5 — Contact: Enclosed Interactions Inc., 1 Independence Way, Princeton, N.J. 08540.

PCE, Chicago, Oct. 8-9 — Contact: PC Expo, 285 Sylvan Ave., Englewood Cliffs, N.J. 07632.

Westcom, Manufacturing, Oct. 9-14 — Contact: Electronic Mail Association, Suite 355, 1255 Wisconsin Blvd., Arlington, Va. 22209.

OCTOBER 8-13

Tradecore '92, an annual conference of Wm. Wrigley Jr. Co., Oct. 8-11 — Contact: United States Society of Wm. Wrigley, Inc., 300 31st St., Chicago, Ill. 60605.

North American ISDN Users' Forum, Phoenix, Oct. 9-13 — Contact: ISDN Users Forum, NIST - MU Forum Administration, 100 Bureau Dr., Bldg. 233, Gaithersburg, Md. 20892.

PC/COM '92 World Showcases, Manufacturer and Retailer, Gwinnett, Ga., Oct. 4-6 — International Telecommunications Unit (ITU), ITU-COM '92 Secretariat, International Telecommunications Union, Place des Nations, CH-1211 Geneva 20, Switzerland.

Computer Security Conference, San Francisco, Oct. 4-6 — Contact: Computer Security Conference, Inc., Box 2000, 1 Independence Way, Princeton, N.J. 08540.

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AdAge's Management Conference, Orlando, Fla., Oct. 4-6 — Contact: Prentice-Hall Inc., AdAge, 1200 North Seventh St., Suite 2000, Arlingtton, Va. 22296-3899.

Computer Services Seminar and Computer Systems & Information Services Seminar, Bethesda, Md., Oct. 4-6 — Contact: Divco West, Attn: Divco & Sons, 155 E. Bellamy Rd., Bethesda, Md. 20205.

66 COMPUTERWORLD

**TAKING
CHARGE**
Clinton Wilder

The business culture dilemma

Bridging the cultural gap between the information systems department and the world of line managers and business executives is probably the critical success factor for any firm's IS today. Reams have been written and millions of consulting dollars spent on the subject, but it seems to me the gap stems from a fairly simple dichotomy.

The world of the IS professional, the technologist, is, in one certainty. The very nature of digital computing makes it such. Machine language is either a binary 1 or a 0; the gate on the semiconductor chip is either open or closed. And the result of the technology — data — means facts and figures that are tangible, hard and finite.

But the world of the businessman, particularly in 1989, is a confusing cacophony of fear, uncertainty and doubt that not even the most aggressive IBM account control salesmen of the 1970s could have dreamed up.

At the Enterprise-Wide Information Management (EWIM) Conference in St. Louis earlier this month, Gartner Group consultant Bruce Rogow asked the crowd of about 300 to raise their hands if their company had kept the same top management and strategy for the past three years. Maybe a dozen hands went up.

Management transition and turnover is just the tip of the iceberg. Today a business executive is like the Hindley character in *The Black County Comix*, strip who is taking night classes while ogre is lurking in the bedroom closer than his worst fears. The corporate takeover beast is certainly in there, but he shares the closet space with Japan, Inc., Fortress Europe, fickle customers, potential shareholder lawsuits and recession worries.

It wasn't always this way. In the post-war economic boom that embraced the Alfred Sloan philosophy of management and the still-prevalent U.S. corporate culture, concepts such as low-cost production and economies of scale virtually guaranteed business success. Demand was steady, foreign competition was nonexistent, and the corporate engines of America required little more than regular oil changes to keep churning out profits.

The data processing manager, who supplied the oil, thought his life was pretty certain, too. Lifelong employment was not just promised by the DP manager who followed two simple rules: Don't screw up and don't go over budget.

These days are long gone in any remotely progressive corporation, but the cultural dichotomy between the certainty of the technologist and the uncertainty of the business world remains.

Let's take a hypothetical example. An auto parts manufacturer asks its IS department for an on-line order entry system for its valve division. The system is developed and delivered on time (let's

say in a year), on budget, and meets all the user specs. But because of changing business conditions, it is virtually useless — the IS equivalent of "The operation was successful, but the patient died."

During the year of development, suppose any one of the following occurred:

- The division is put on the selling block because the parent firm has been advised by its chief financial officer that its stock is underperformed and is a prime fodder for an acquirer's bid.

- A K-Mart fire blindsides the market with a new valve priced 50% below most U.S. companies' quotes, and management is considering exiting the business.
- The newly hired division vice-president decides to completely restructure the sales function in a way that makes

this order entry system irrelevant.

More than ever, the rules of the business game are such that access to accurate, timely information is only the starting point for making the right move. "The top guys don't really deal with hard data," said Don Winkler, Warner Communications' executive director of corporate IS, at the EWIM conference. "Decisions are based more on emotional relationships and deal making." And one top executive, Minicab Land President Robert Unshurp, said, "It's impossible for me to say what information I need until I need it."

So even as information proliferates throughout a company, it does not translate into strategic advantage or increased productivity because today's

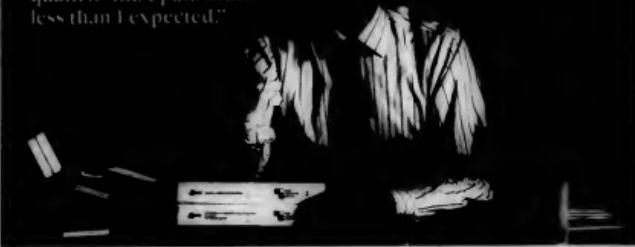
business world is so unstable and uncertain.

What's the answer? The same one you've heard many times before: communicate, communicate and communicate. The only way the IS professional from the world of technology certainty can cross the line to the business domain is by constant interaction and exchange.

The IS executive must realize the uncertainty, become conversant with the fears that keep the chief executive officer or manufacturing VP awake at night, and understand that the success of data and technology are constantly threatened by the business ogres in Blakely's closet.

Wilder is *Computerworld's* senior editor, management.

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WYSE

HARDWARE ROUNDUP

PCs, WORKSTATIONS AND SMALL SYSTEMS

More PC players, but fewer innovators

BY JOHN J. XENAKIS

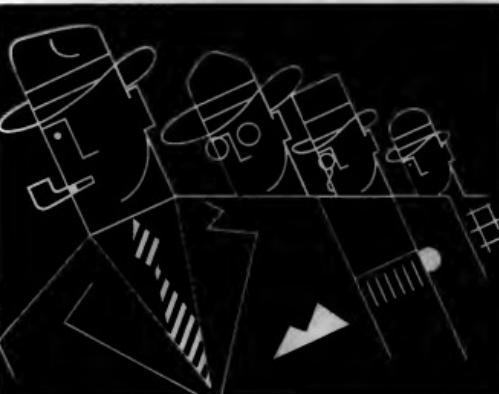
While last year's changes in the personal computer world were evolutionary, not revolutionary, the major news flash would seem to be IBM's loss of market share. According to La Jolla, Calif.-based Computer Intelligence, IBM's percentage of market share for units sold into the Fortune 1,000 slipped from 72% to 64% between 1988 and 1989. The slack was picked up by its competition, including Compaq Computer Corp. and Apple Computer, Inc.

The decrease in IBM's market penetration is only a small part of the story, however. One clue to the bigger picture is that, for IBM, sales are up, even though its share is down, according to San Jose, Calif.-based Dataquest, Inc. estimates.

What is really happening here is a broadening of the PC market into one where the micro is just a commodity. While IBM may sell more PCs, other vendors are also building an installed base, thus reducing IBM's share. The industry has been edging in this direction for some time, but last year was a watershed, with panies steering away from pure brand loyalty.

IBM has felt some effects from this dilution, but the biggest impact has been felt in the so-called middle tier of clone makers, where many vendors have simply washed away, and in the bottom tier, where little but price matters anymore.

It was only two years ago that there were three well-established tiers of IBM Personal Computer compatible manufacturers. The top level — IBM, Compaq, AT&T, ITT Corp., Zenith Data Systems and a few others — spent a great deal of development dollars to be on the



NEW CLOTHES

leading edge of technology. Fortune 500 companies bought almost exclusively from these companies, and brand loyalty was high. This loyalty is still high but not as unshakable.

The middle tier — including Dell Computer Corp., Leading Edge Hardware Products, Inc. and AST Research, Inc. — took the latest IBM hardware and added a few bells and whistles to make it more competitive at a lower price than IBM's.

But brand loyalty in the upper tier and competitive pricing in the bottom tier washed out much of the price differentiation in the middle. Packard Bell Electronics, Inc. and Leading Edge were

the primary examples of this. The bankruptcy of Leading Edge last February exemplifies, perhaps more than anything else, the continuing demise of this tier.

The bottom tier contains just a few companies that provide the least expensive clones, with al-

most no original engineering.

Today, almost anyone can build an IBM PC clone in his basement or garage. Many suppliers have sprung up to cater to that business, providing a variety of components and packaging. Buying in quantity can reduce manufacturing costs to slightly more than \$100 for an entire entry-level system.

Thus, the cost to enter the PC-compatible market is extremely low, and many firms have taken advantage of that fact to seek out a slice of the market. With current technology, these clones are basically compatible with top-line DOS systems. In that sense, PCs are not much of a commodity item any more. Indeed, the bottom tier's low prices have forced the middle tier to drop prices to the point at which, for the most part, the products are indistinguishable.

"Competitive pressure is causing companies to operate on

INSIDE

Testing the Waters

Laptops move out of their corner and into the mainstream. Page 74.

Changing Players

Mergers and new rivals shake workstation market. Page 83.

Big Three

In small systems, all roads lead to IBM, DEC and Unix. Page 91.

Xenakis is a free-lance writer and media commentator on the computer industry.

PC players

FROM PREVIOUS PAGE

decreasing gross margins," notes Bill Lassarre, a senior industry analyst at Dataquest. "That's putting pressure on a lot of IBM clone makers."

This pressure has made life difficult for established companies, particularly in the middle tier. For example, in August, Tandon Corp. announced price cuts, reduced its computer line and trimmed its staff by 20%. Wyse Technologies also cut its prices by 12% following three quarters of losses.

Even the top tier was not immune. In late August, Compaq announced cuts of \$300 to \$1,300 for its Deskpro 386/25 and 386/20E product lines.

Chip influence

One factor in the melding of the market has been influences from the microprocessor arena. Price cuts for the Intel Corp. 80386SX chip in the early part of the year led many vendors to introduce lower priced systems, a move that may have factored in the recent price drops for 386 machines in general.

Intel's announcement of its 80486 chip also played a part. The chip, touted for its speed

and reverse compatibility, was well received by vendors 18 of which quickly announced intentions to provide a 486 marketplace in June. UK-based Apricot Computers and Acer Technologies Corp., a Taiwanese vendor, were the first to announce 486-based systems, with delivery for both slated for the last quarter of this year.

The first actual shipments of 486-based machines were made Aug. 18 by U.S.-based IBM Systems. A number of the 486 models are expected to be shipped in time for Comdex/Fall '89.

The first U.S. 486 announcement came from IBM but not in the form of a complete 486 system. In June, IBM announced an add-in board that is said to convert its 386-based Personal System/2 Model 70 into a 486 machine. In July, AST Research and Advanced Logic Research also announced similar add-in boards for their own computers.

There are apparently technical reasons for taking a board-level approach. According to International Resource Develop-

ment's President Kenneth Bosworth, vendors are finding the highest cost of the 486 boards come from its radio emissions up to a frequency and amplitude that present problems."

gic between IBM's 2½-year-old Micro Channel Architecture (MCA) and the not-yet-available alternative Extended Industry Standard Architecture (EISA) is one more way in which vendors

will not be selling EISA machines. "There are three million Micro Channel computers out there," Normans says. "With [add-in] boards now available, there is no question that it will be the industry standard."

Businessland's left hook brought a swift response from Compaq, which less than three weeks later announced that it would no longer permit Businessland to sell Compaq PCs. Businessland had admitted that this termination left them in hot water yet announced a replacement vendor.

There is little doubt that more blood will be spilled over this emotional battle. EISA will undoubtedly become an important industry product, but it is 2½ years behind MCA and has yet to get off the ground.

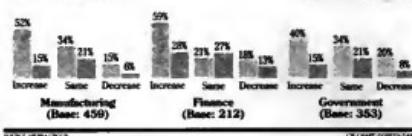
Perhaps more important, while Compaq is encouraging brand loyalty among IBM shops, it is hard to see how EISA will do the same for Compaq. The Compaq Businessland split only emphasizes to users the interchangeability of PCs and encouraged them to seek low-cost alternatives.

Perhaps Compaq realized this

The more things change . . .

A majority of organizations say their PC expenditures for 1989 will increase; few see their mainframe expenditures doing the same

PERCENT OF RESPONDENTS



(COURTESY: COMPUTERWORLD SURVEY)

Adding the 486 on a separate board, which need not be certified by the Federal Communications Commission, allows a vendor to bypass the problem, Bosworth adds.

How much of an effect the 486 will have on the market as a whole remains to be seen. Chances are that its cost — \$950 each in quantities of 1,000 — could be a dampener in a market in which price, not performance, is a critical purchasing criterion.

The current territorial strug-

are seeking to differentiate themselves.

In February, IBM put full its weight behind MCA, partially in reaction to the EISA counter-revolution spawned by the so-called "Gang of Nine," which includes Compaq and Hewlett Packard Co.

The MCA/EISA battle spilled over into the retail arena when David Norman, president of Businessland, Inc., the nation's largest independent computer retail chain, announced Feb. 2 that his organi-



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Program Committee Meeting
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January 19 1990

Return of Revised, Final Paper to AAAI office:
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when, in July, it announced a cross-licensing agreement with IBM that gives it access to all of IBM's patents before 1993. The agreement, which includes MCA and other technologies, is seen by analysts to be Compaq's way of covering its bases, despite Compaq's denials to the contrary.

Almost, but not quite

Apple's Macintosh continues to be slowly accepted in the business marketplace. According to Dataquest, the Mac's market share in Fortune 1,000 companies has grown in the last year from 4% to 6%. However, the Mac seems almost at a standstill in comparison with the PC. While the PC and compatible marketplace continues to expand, Apple's continuing struggle on development alternatives has kept would-be Mac customers at bay.

A couple of vendors have attempted to get past the fortress of Mac individuality. Last month, Salt Lake City-based Powder Blue Computers and Taiwanese Akkord Technology announced lower priced Mac clones. The companies skirted Apple's basic copyright by obtaining Mac read-only memory BIOS chips from third-party service organizations.

Apple's strategy of trying to maintain its individuality has backfired in another sense. Its well-known but unsuccessful copyright violation lawsuit against Microsoft Corp. and HP has caused industry resentment, as indicated by one analyst's statement that people are learning "to love the Mac but hate Apple."

The company's pricing policies have

not helped, either. "The Mac was getting to the point where it might be an acceptable machine to the Fortune market, [and then] Apple raised the prices," says Jim Hammons, manager of Technical Advisory Services at The Siegel Group, Inc. As he points out, "If Apple raises its prices and your standard is Apple, you pay the new price. But if IBM raises prices."

The result is a major problem for Apple, which was acknowledged by company President John Sculley in a February interview. "What we have found is taking to large installations of... Macintoshes," he says, "is that they're not ready to put \$5,000 to \$10,000 computers on everybody's desk."

Sculley's statement came after a late-

1988 round of price hikes for most of the Apple products, including a 29% increase for the top-of-the-line Macintosh II. Even the Macintosh II GX, a smaller version introduced in mid-March, entered the market with a bottom-line price tag of \$4,699.

Apple blamed the price increases on the high cost of memory resulting from the 1988 to '89 chip shortage. However, prices of PCs and compatibles also faced with the same shortage, have dropped during the same time, clearly pricing the Macintosh out of the league.

Bosomworth says his company learned from personal experience of the large gap between the Mac and the clones.

"The Macs in the configurations we wanted were getting to be \$5,000 to

\$6,000 each," he says, "while the name 386 clones with the equivalent configurations were coming in at \$2,500 to \$2,600. I think Apple's out on a rather difficult limb."

Wright indicated that a \$1,000 Mac was under development, no word of the existence of such a machine has yet surfaced.

In that sense, Apple is very much on the same wavelength as the rest of the PC market, where rumors, expectations and intimations of IBM slippage have provided more drama than actual developments this year. Until user requirements change dramatically, the governing reality in the IBM and compatible sector will be status quo for the big names and shrinking margins for everyone else. *

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I PROBABLY SEE ROUGHS IN COMPUTERS. EVEN OF THEM.



Mainstreaming the laptop

BY RICHARD PASTORE

If laptop computers have been merely high-priced niche players during the past five years, then the last 12 months have seen them move away from the industry periphery and wade out into the business mainstream.

"Last year, a lot of things came together so that the overall quality of the products improved and more buyers were drawn into the market," says Bruce Ste-

Pastore is a Computerworld staff writer.

phen, an analyst at Framingham, Mass.-based market research firm International Data Corp. (IDC).

One of the most important recent developments for the sector was that Compaq Computer Corp. finally decided to take the plunge.

Before the rollout of Compaq's best-selling SLT/286 portable machine last October, "the sector really suffered from not having a major brand leader in it," according to Dick Shaffer, editor and pub-

lisher of the "Technologic Computer Letter."

Analysts have noted that technical advances have also contributed to the rapid mainstreaming of the laptop. Faster microprocessors such as the Intel Corp. 80286, hard disks and more readable screens have all become second nature for the machine. Innovations and technologies such as "notebook" configurations, Intel Corp. 80386 engines and machines with no moving parts have gained a toehold.

The advent of the notebook-size portable has been greeted with acclaim. "We're finally beginning to step over the line to real machines that fit in a briefcase and leave room for something else," Shaffer says.

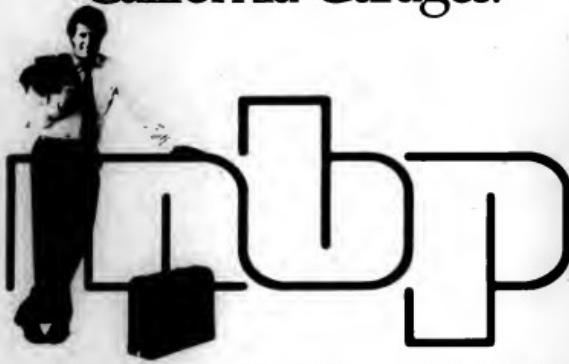
NEC Corp.'s 4.4-pound UltraSite portable broke ground in the category, which has been further cultivated by Zenith Data Systems' first notebook computer. The Zenith Minisport, unveiled this summer, is about the size of an inch-thick stack of paper, weighs six pounds and costs less than \$2,000.

Two-inch floppy disk drives and silicon "memory cards" help make notebook computers possible. "The memory card looks like a credit card and allows for great reduction in battery demand because there's no spinning motor," Shaffer explains.

The UltraSite and Minisport are not expected to have the niche to themselves for long, however. "We'll see most major players come out with something note-book-sized or under," Stephen predicts.

It doesn't come cheaply
This nifty technology is not inexpensive. "Portables are 20% to 50% more expensive than comparable desktop machines," Shaffer says. So for now, the target users for all types of portables will remain those people who absolutely need portability, such as field-service professionals.

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FASTER microprocessors such as the Intel Corp. 80286, hard disks and more readable screens have all become second nature for the laptop. Innovations such as "notebook" configurations have gained a toehold.

However, even that market contains vast untapped potential. More than 1.2 million IBM-compatible portable machines have been sold in the U.S., but there are still six million to seven million mobile field-service professionals who are prime prospects for a product that is small enough to be easily carried and stowed, according to Stephen.

Their expectation that portables are making inroads. IDC estimates that unit shipments for the sector by the end of the calendar year will total \$500,000, a 32% hike over last year's total. Natick, Mass.-based market research firm Venture Development Corp. expects the market to grow an average of 34% annually through 1993.

Slim & gap
Although this progress is impressive, it is still a far cry from the sweep that some industry insiders predicted. Laptops will not topple desktop boxes any time soon, Stephen says. "There's still a fairly significant price gap between portables and desktops," he says. "A 286-based portable sells for an average \$3,500, while a 286-based desktop machine costs \$1,500 on the street." Also, he adds, the fact that prices are dropping for 386-based desktop models makes the idea of an up-to-date laptop less likely.

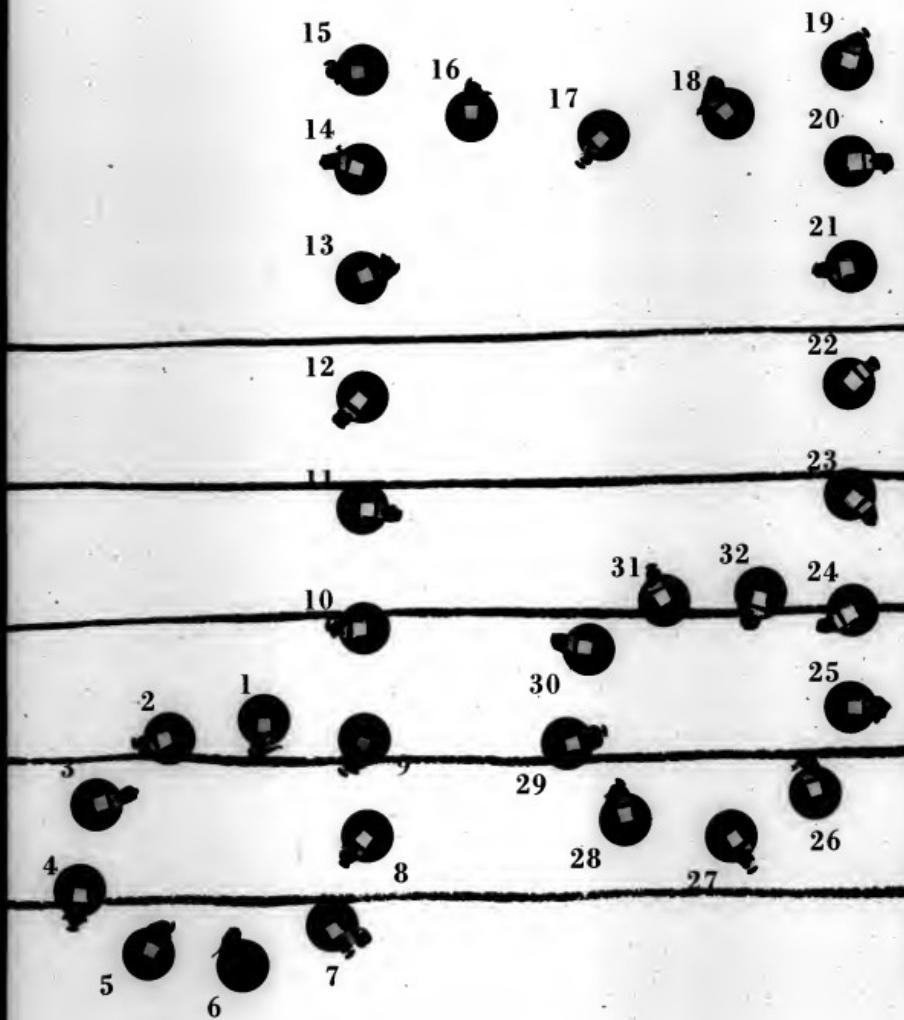
Meanwhile, laptop vendors are forging ahead with new technologies and innovations. Agilis Corp., for example, is making a concerted effort in "handheld, modular workstations" linked by wireless local-area networks.

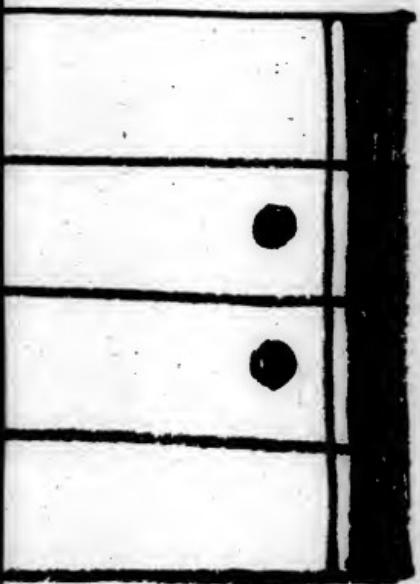
The Mountain View, Calif.-based *Continued on page 82*

Personal computers: 80286 and higher

COMPANY	PRODUCT ¹	CPU	CLK/CLOCK SPEED (MHz)	OPERATING SYSTEM	INTERNAL MEMORY (Megabytes)	DISK STORAGE (Megabytes)	NUMBER AND TYPE OF EXTERNAL PORTS	NUMBER OF SERIAL PORTS	NUMBER OF PARALLEL PORTS	DISPLAY OR PORTABLE	FOOTPRINT (Inches)	09/13 REPORT	VERSION OF OS/BASIC FOR SYSTEM	0		TYPE OF BASIC	SERVICES PROVIDED BY	PRICE
														NAME OF GRAPHICS CARD	TYPE OF RAMS			
Acer America (446-923-6333)	Acer 800/13	80386	22	DOS	3-16	512-1440	1-2	512-1440, 1mb	2	1	Desktop	12 x 18.4 x 8.2	Ten	Yes	No	AT	Dealer, third party	\$1,440
	Acer 810	80386	22	DOS	5120-12M	1-32	1-2	512-1440, 1mb	2	1	Desktop	12 x 18.4 x 8.2	Ten	Yes	No	AT	Dealer, third party	\$1,440
	Acer 815	80386	22	DOS	3120-14M	1-32	1-2	Power 10-M	1	1	Desktop	14.2 x 18.4 x 8.2	Ten	Yes	NP	AT	Dealer, third party	\$1,640
	Acer 2100/PT	80386	22	DOS	4-16	1-32	1-2	One 32-MB, two 16-MB, one 8-MB, one 4-MB, one 2-MB, one 1-MB, one 512-KB	2	1	Desktop	20.8 x 14.5 x 8.2	NP	Yes	AT	AT	Dealer, third party	\$7,000
	Acer 2100/PS	80386	22	DOS	3-16	512-1440	1-2	One 32-MB, two 16-MB, one 8-MB, one 4-MB, one 2-MB, one 1-MB, one 512-KB	2	1	Desktop	20.8 x 14.5 x 8.2	Ten	Yes	AT	AT	Dealer, third party	\$1,300
Advanced Logic Research, Inc. (800) 443-6427	Flex Cache 3128MZ	80386	22	DOS, OS/2, Unix, Linux	1-32	1200	One 22-MB, one 16-MB, one 10-MB, one 8-MB, one 4-MB, one 2-MB, one 1-MB, one 512-KB	1	1	Desktop	14.2 x 18.4 x 8.2	NP	AT	AT	AT	Dealer, third party	\$1,900-91,200	
	Flex Cache 7128MZ	80386	22	DOS, OS/2, Unix, Linux	3-16	1200	One 32-MB, one 16-MB, one 10-MB, one 8-MB, one 4-MB, one 2-MB, one 1-MB, one 512-KB	1	1	Desktop	14.2 x 18.4 x 8.2	NP	AT	AT	AT	Dealer, third party	\$1,490-87,400	
	Flex Cache 8532MZ	80386	22	DOS, OS/2, Unix, Linux	3-16	1200	One 32-MB, one 16-MB, one 10-MB, one 8-MB, one 4-MB, one 2-MB, one 1-MB, one 512-KB	1	1	Desktop	14.2 x 18.4 x 8.2	NP	AT	AT	AT	Dealer, third party	\$1,490-91,400	
	Flex Cache 25160MZ	80386	22	DOS, OS/2, Unix, Linux	3-16	1200	One 32-MB, one 16-MB, one 10-MB, one 8-MB, one 4-MB, one 2-MB, one 1-MB, one 512-KB	1	1	Desktop	14.2 x 18.4 x 8.2	NP	AT	AT	AT	Dealer, third party	\$2,090-64,000	
	Flex Cache 5120MZ	80386	18	DOS, OS/2, Unix, Linux, VxWorks	512-16	40	One 512-MB, one 16-MB, one 10-MB, one 8-MB, one 4-MB, one 2-MB, one 1-MB, one 512-KB	1	1	Desktop	14.2 x 18.4 x 8.2	NP	AT	AT	AT	Dealer, third party	\$2,710-64,100	
Amkab Corp. (800) 732-6330	Amkab System 2000	80386	18	DOS, OS/2, Unix, Linux	1-32	1200	One 32-MB, one 16-MB, one 10-MB, one 8-MB, one 4-MB, one 2-MB, one 1-MB, one 512-KB	1	1	Desktop	14.2 x 18.4 x 8.2	NP	AT	AT	AT	Dealer, third party	\$1,300-61,300	
	Amkab System 2000-A	80386	18	DOS, OS/2, Unix, Linux	1-32	1200	One 32-MB, one 16-MB, one 10-MB, one 8-MB, one 4-MB, one 2-MB, one 1-MB, one 512-KB	1	1	Desktop	14.2 x 18.4 x 8.2	NP	AT	AT	AT	Dealer, third party	\$1,300-61,300	
	Amkab System 2000-B	80386	18	DOS, OS/2, Unix, Linux	1-32	1200	One 32-MB, one 16-MB, one 10-MB, one 8-MB, one 4-MB, one 2-MB, one 1-MB, one 512-KB	1	1	Desktop	14.2 x 18.4 x 8.2	NP	AT	AT	AT	Dealer, third party	\$1,300-61,300	
	Amkab System 2000-C	80386	18	DOS, OS/2, Unix, Linux	1-32	1200	One 32-MB, one 16-MB, one 10-MB, one 8-MB, one 4-MB, one 2-MB, one 1-MB, one 512-KB	1	1	Desktop	14.2 x 18.4 x 8.2	NP	AT	AT	AT	Dealer, third party	\$2,090-64,200	
	Amkab System 2000-D	80386	18	DOS, OS/2, Unix, Linux	1-32	1200	One 32-MB, one 16-MB, one 10-MB, one 8-MB, one 4-MB, one 2-MB, one 1-MB, one 512-KB	1	1	Desktop	14.2 x 18.4 x 8.2	NP	AT	AT	AT	Dealer, third party	\$2,090-64,200	
Applied Digital Signal Systems, Inc. (813) 231-6400, Ext. 882	Monitor 17700A	80386	22	PC/AT	940K	NP	1-16	NP	2	1	Desktop	19 x 17 x 7	No	No	C/COMA	AT	Third party	\$1,450-61,110
	Monitor 18000	80386	22	PC/AT	2-160	NP	-	2	1	Desktop	19 x 17 x 7	No	No	C/COMA	AT	Third party	\$1,450-61,110	
	Monitor 18000-A	80386	22	PC/AT	2-160	NP	-	2	1	Desktop	19 x 17 x 7	No	No	C/COMA	AT	Third party	\$1,450-61,110	
	Monitor 18000-B	80386	22	PC/AT	2-160	NP	-	2	1	Desktop	19 x 17 x 7	No	No	C/COMA	AT	Third party	\$1,450-61,110	
	Monitor 18000-C	80386	22	PC/AT	2-160	NP	-	2	1	Desktop	19 x 17 x 7	No	No	C/COMA	AT	Third party	\$1,450-61,110	
Arco Technologies (415) 655-6195	Through 99	80386-12	6-12	DOS, Unix, OS/2, Linux	1-128	1-128	Two 32-MB, three 16-MB, three 8-MB, three 4-MB, three 2-MB, three 1-MB, three 512-KB	2	2	Desktop	14.2 x 18.4 x 8.2	Yes	No	No	Arcom, AT	Dealer, third party	\$1,200-61,200	
	Through 99-V	80386-12	4,77-34	DOS, Unix, OS/2, Linux	1-128	1-128	Two 32-MB, three 16-MB, three 8-MB, three 4-MB, three 2-MB, three 1-MB, three 512-KB	2	2	Desktop	14.2 x 18.4 x 8.2	Yes	No	No	Arcom, AT	Dealer, third party	\$1,200-61,200	
	Modem 200	80386-12	6-12	DOS, OS/2, Unix, Linux	940K	1-128	Two 32-MB, three 16-MB, three 8-MB, three 4-MB, three 2-MB, three 1-MB, three 512-KB	2	2	Desktop	14.2 x 18.4 x 8.2	Yes	No	No	Arcom, AT	Dealer, third party	\$2,000	
	Modem 200-10	80386-12	6-12	DOS, OS/2, Unix, Linux	940K	1-128	Two 32-MB, three 16-MB, three 8-MB, three 4-MB, three 2-MB, three 1-MB, three 512-KB	2	2	Desktop	14.2 x 18.4 x 8.2	Yes	No	No	Arcom, AT	Dealer, third party	\$2,000	
	Modem 200-100	80386-12	6-12	DOS, OS/2, Unix, Linux	940K	1-128	Two 32-MB, three 16-MB, three 8-MB, three 4-MB, three 2-MB, three 1-MB, three 512-KB	2	2	Desktop	14.2 x 18.4 x 8.2	Yes	No	No	Arcom, AT	Dealer, third party	\$2,000	
AST Research, Inc. (714) 945-1333	Per-Flo 200	80386	3-16	DOS, OS/2, Unix	3-16	1-128	Two 32-MB, three 16-MB, three 8-MB, three 4-MB, three 2-MB, three 1-MB, three 512-KB	2	2	Parallel	19 x 17 x 7	Yes	No	No	Arcom, AT	Dealer, third party	\$1,200	
	Per-Flo 200	80386	16,32	DOS, OS/2, Unix	3-16	1-128	Two 32-MB, three 16-MB, three 8-MB, three 4-MB, three 2-MB, three 1-MB, three 512-KB	2	2	Parallel	19 x 17 x 7	Yes	No	No	Arcom, AT	Dealer, third party	\$1,200	
	Modem 300	80386	16,32	DOS, OS/2, Unix	3-16	1-128	Two 32-MB, three 16-MB, three 8-MB, three 4-MB, three 2-MB, three 1-MB, three 512-KB	2	2	Parallel	19 x 17 x 7	Yes	No	No	Arcom, AT	Dealer, third party	\$1,200	
	Processor 300/12	80386	3-20	DOS, OS/2, Unix	3-20	1-128-640K	One 8-MB, three 4-MB, three 2-MB, three 1-MB, three 512-KB	2	2	Desktop	14.2 x 18.4 x 8.2	Yes	Yes	AT	Dealer, third party	\$9,000-64,240		
	Processor 300/16	80386	16	DOS, OS/2, Unix	3-16	40-320	One 32-MB, three 16-MB, three 8-MB, three 4-MB, three 2-MB, three 1-MB, three 512-KB	2	2	Desktop	14.2 x 18.4 x 8.2	Yes	Yes	AT	Dealer, third party	\$9,000-64,240		
Processor 300/20	Processor 300/20	80386	20	DOS, OS/2, Unix	3-20	40-320	One 32-MB, three 16-MB, three 8-MB, three 4-MB, three 2-MB, three 1-MB, three 512-KB	2	2	Desktop	14.2 x 18.4 x 8.2	Yes	Yes	AT	Dealer, third party	\$9,000-64,240		
	Processor 300/24	80386	24	DOS, OS/2, Unix	3-24	40-320	One 32-MB, three 16-MB, three 8-MB, three 4-MB, three 2-MB, three 1-MB, three 512-KB	2	2	Desktop	14.2 x 18.4 x 8.2	Yes	Yes	AT	Dealer, third party	\$9,000-64,240		
Processor 300/28	Processor 300/28	80386	28	DOS, OS/2, Unix	3-28	40-320	One 32-MB, three 16-MB, three 8-MB, three 4-MB, three 2-MB, three 1-MB, three 512-KB	2	2	Desktop	14.2 x 18.4 x 8.2	Yes	Yes	AT	Dealer, third party	\$9,000-64,240		
	Processor 300/32	80386	32	DOS, OS/2, Unix	3-32	40-320	One 32-MB, three 16-MB, three 8-MB, three 4-MB, three 2-MB, three 1-MB, three 512-KB	2	2	Desktop	14.2 x 18.4 x 8.2	Yes	Yes	AT	Dealer, third party	\$9,000-64,240		

The companies included in this chart responded to a recent telephone survey conducted by Computerworld. When a vendor is unable to provide specific information about its product, the abbreviation NP (not provided) is used. When a question does not apply to a vendor's product, the abbreviation NA (not applicable) is used. Further product information is available from the vendors.





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COMPANY	PRODUCT	CPU	CLOCK SPEED (MHz)	OPERATING SYSTEM	INTERNAL MEMORY (megabytes)	DISK STORAGE (megabytes)	NUMBER OF SERIAL PORTS	NUMBER OF PARALLEL PORTS	SHUTDOWN ON POWERFAIL	FOOTPRINT (inches)	CGA/2 SUPPORT	VERSION OF CGA/2 SPECIFIC FOR SYSTEM	BUILT-IN DRIVERS FOR PC/AT	TYPE OF BAUDS	SERVICE/HANDOUT BY	PRICE		
APT Research, Inc. (713) 650-5250	Personal Workstation Model 1000	80386	10	DOS, OS/2, Unix, VMS, VMS/VX	1600	1.2-40	Three 14.1-in. monochrome	1	1	Desktop	12.5 x 14.5 x 3.5	Yes	No	No	AT	None, add-in card, serial port	\$1,495-\$2,295	
	Personal Workstation Model 2000	80386	2	DOS, OS/2, Unix, VMS/VX	1600	1.2-40	Two 14.1-in. monochrome	1	1	Desktop	12.5 x 14.5 x 3.5	Yes	No	No	AT	None, add-in card, serial port	\$1,945-\$2,295	
	Personal Workstation Model 70	80386	10	DOS	40	—	One 14.1-in. monochrome	1	1	Desktop	12.5 x 14.5 x 3.5	Yes	No	No	AT	None, add-in card, serial port	\$1,895	
AT&T (800) 247-1312	CGA/2/16 Models 211, 213, 214	80386	20	DOS, OS/2, Unix, VMS/VX	80-160	2-16	Two 14.1-in. monochrome	1	1	Desktop	12.5 x 14.5 x 3.5	Yes	Yes	No	AT	NP	\$4,000-\$8,000	
	CGA/2/16 Model 201, 202, 203	80386SX	10	DOS, OS/2, Unix, VMS/VX	3-16	40-60	One 14.1-in. monochrome	2	1	Desktop	12.5 x 14.5 x 3.5	Yes	Yes	VGA	AT	Vendor	\$2,995-\$4,795	
Bell N. T. Information (800) 525-4400	APL	80386	10	DOS	3-2	30-60	—	—	—	Portable	12.5 x 13.5 x 3.5	No	No	CGA	AT	Vendor	\$4,000-\$5,000	
	SP-100	80386	10	DOS, OS/2	3-16	64-96	One 14.1-in. monochrome	1	1	Desktop	12.5 x 14.5 x 3.5	Yes	No	NP	AT	Vendor	\$3,245-\$4,295	
	SP-200 Series	80386	10	DOS, OS/2	640K	30-120	One 14.1-in. monochrome	1	1	Desktop	12.5 x 14.5 x 3.5	Yes	No	NP	AT	Vendor	\$3,200-\$3,800	
	SP-300	80386	10	DOS, OS/2	3-16	64-96	One 14.1-in. monochrome	1	1	Desktop	12.5 x 14.5 x 3.5	Yes	No	NP	AT	Vendor	\$3,200-\$3,800	
Compaq Computer Corp. (713) 274-4477	Compaq Desktop Model 1, 20, 40	80386	10	DOS, OS/2	640K	1.2-32	One 14.1-in. monochrome	1	1	Desktop	16.5 x 16.5 x 3.5	Yes	Yes	NP	AT	Dealer	\$4,195	
	Compaq Desktop Model 1, 20, 40	80386	10	DOS, OS/2	1-13	24-48, 80	One 14.1-in. monochrome	1	1	Desktop	16.5 x 16.5 x 3.5	Yes	Yes	NP	AT	Dealer	\$3,295	
	Compaq Desktop Model 1, 20, 40	80386SX	10	PC-DOS, OS/2	640K	1-13	24-48, 80	One 14.1-in. monochrome	1	1	Desktop	12.5 x 14.5 x 3.5	Yes	Yes	VGA	AT	Dealer	\$3,295-\$5,000
	Compaq Desktop Model 1, 20, 40	80386SX	10	DOS, OS/2	1-4	144-45, 130	Four 14.1-in. monochrome	2	1	Desktop	12.5 x 14.5 x 3.5	Yes	Yes	VGA	AT	Dealer	\$5,195-\$6,000	
	Compaq Desktop Model 1	80386SX	10	DOS, OS/2	1-13	24-48	One 14.1-in. monochrome	1	1	Desktop	12.5 x 14.5 x 3.5	Yes	Yes	VGA	AT	Dealer	\$3,295	
	Compaq Portable Model 20	80386SX	10	DOS, OS/2	1-13	24-48	One 14.1-in. monochrome	1	1	Desktop	12.5 x 14.5 x 3.5	Yes	Yes	VGA	AT	Dealer	\$4,195	
	Compaq Portable Model 20	80386SX	10	DOS, OS/2	1-13	48-96	One 14.1-in. monochrome	1	1	Desktop	12.5 x 14.5 x 3.5	Yes	Yes	VGA	AT	Dealer	\$4,000	
	Compaq Portable Model 20	80386SX	10	DOS, OS/2	1-2	140-180	Two 14.1-in. monochrome	1	1	Portable	12.5 x 14.5 x 3.5	Yes	Yes	VGA	AT	Dealer	\$5,000	
	Compaq Laptop Model 20	80386	10	DOS, OS/2	1	64, 120, 200	One 14.1-in. monochrome	1	1	Desktop	17 x 20 x 4	Yes	Yes	NP	AT	Dealer	\$7,295-\$8,300	
	Compaq Portable Model 20	80386SX	10	DOS, OS/2	1-16	64, 120, 200	One 14.1-in. monochrome	1	1	Desktop	12.5 x 14.5 x 3.5	Yes	Yes	VGA	AT	Dealer	\$11,495	
	Compaq Portable Model 20	80386SX	10	DOS, OS/2	1-16	64, 120, 200	One 14.1-in. monochrome	1	1	Portable	12.5 x 14.5 x 3.5	Yes	Yes	NP	AT	Dealer	\$10,995	
	Compaq Portable Model 2, 4	80386SX	8	DOS, OS/2	240K	20	One 14.1-in. monochrome	1	1	Portable	12.5 x 14.5 x 3.5	Yes	Yes	NP	AT	Dealer	\$10,995-\$12,995	
	Compaq Portable Model 20	80386SX	10	DOS, OS/2	240K	20	One 14.1-in. monochrome	1	1	Portable	12.5 x 14.5 x 3.5	Yes	Yes	NP	AT	Dealer	\$10,995-\$12,995	
	Compaq Portable Model 20	80386SX	10	DOS, OS/2	240K	20	One 14.1-in. monochrome	1	1	Portable	12.5 x 14.5 x 3.5	Yes	Yes	NP	AT	Dealer	\$10,995-\$12,995	
	Compaq Portable Model 20	80386SX	10	DOS, OS/2	240K	20	One 14.1-in. monochrome	1	1	Portable	12.5 x 14.5 x 3.5	Yes	Yes	NP	AT	Dealer	\$10,995-\$12,995	
Gateway, Inc. (800) 525-4400	G1000	80386	20	DOS, OS/2	8	—	Two 17-in. monochrome	2	1	Desktop	12.5 x 14.5 x 3.5	Yes	No	No	AT	None	\$1,495	
	G1000	80386	20	DOS, OS/2	8	—	One 14.1-in. monochrome	1	1	Desktop	12.5 x 14.5 x 3.5	Yes	No	No	AT	None	\$1,495	
Hayes General Corp. (800) 220-5420	Hayesport 100	80386	10	DOS, OS/2	1-4	144-480	Two 14.1-in. monochrome	2	1	Desktop	12.5 x 14.5 x 3.5	Yes	Yes	CGA	AT	Dealer	\$12,795-\$13,795	
	Hayesport 100	80386SX	10	DOS, OS/2	4-8	40-96	Three 14.1-in. monochrome	3	1	Desktop	17.5 x 21.5 x 3.5	Yes	Yes	VGA	AT	Dealer	\$12,000-\$13,000	
	Hayesport 100	80386SX	10	DOS, OS/2, UNIX	1-16	156-222	Two 14.1-in. monochrome	2	1	Desktop	12.5 x 14.5 x 3.5	Yes	Yes	VGA	AT	Dealer	\$14,000-\$20,700	
Hewlett-Packard Co. (800) 255-4475	HP 1000	80386	20	DOS, OS/2, UNIX	240K	240	One 14.1-in. monochrome	1	1	Desktop	12.5 x 14.5 x 3.5	Yes	Yes	VGA, VGA+	AT	None, add-in card	\$10,995-\$14,795	
	HP 1000	80386	20	DOS, OS/2, UNIX	240K	240	One 14.1-in. monochrome	1	1	Desktop	12.5 x 14.5 x 3.5	Yes	Yes	VGA, VGA+	AT	None, add-in card	\$10,795-\$14,595	
	HP 1000	80386	20	DOS, OS/2, UNIX	240K	240	One 14.1-in. monochrome	1	1	Desktop	12.5 x 14.5 x 3.5	Yes	Yes	VGA, VGA+	AT	None, add-in card	\$10,595-\$14,395	
Hewlett-Packard Co. (800) 255-4475	HP 2000	80386	20	DOS, OS/2, UNIX	240K	240	One 14.1-in. monochrome	1	1	Desktop	12.5 x 14.5 x 3.5	Yes	Yes	VGA, VGA+	AT	None, add-in card	\$10,595-\$14,395	
Hewlett-Packard Co. (800) 255-4475	HP 3000	80386	20	DOS, OS/2, UNIX	240K	240	One 14.1-in. monochrome	1	1	Desktop	12.5 x 14.5 x 3.5	Yes	Yes	VGA, VGA+	AT	None, add-in card	\$10,595-\$14,395	
Hewlett-Packard Co. (800) 255-4475	HP 4000	80386	20	DOS, OS/2, UNIX	240K	240	One 14.1-in. monochrome	1	1	Desktop	12.5 x 14.5 x 3.5	Yes	Yes	VGA, VGA+	AT	None, add-in card	\$10,595-\$14,395	
Digital Equipment Corp. (800) 466-6111	Decstation 200, 300	80386	10, 14	DOS	3-16, 32	40-120	Two 17-in. monochrome	1	1	Desktop	14 x 18 x 6.5	Yes	No	VGA	AT, XT	Dealer	\$14,995-\$17,995	
Microelectronics Inc. (800) 255-4475	Super 10+	80386	8, 10	DOS, OS/2	1-16	30-96	Three 14.1-in. monochrome	1	1	Desktop	12.5 x 14.5 x 3.5	Yes	Yes	No	AT	None	\$10,995-\$12,995	
	Super 10+	80386	8, 10	DOS, OS/2	1-16	30-96	Three 14.1-in. monochrome	1	1	Desktop	12.5 x 14.5 x 3.5	Yes	Yes	No	AT	None	\$10,995-\$12,995	

PCs, WORKSTATIONS AND SMALL SYSTEMS
HARDWARE ROUNDUP

COMPANY	PRODUCT	CPU	CLOCK SPEED (MHz)	UPGRADING SYSTEM	INTERNAL MEMORY (megabytes)	DISK STORAGE (megabytes)	NUMBER OF EXPANSION SLOTS	NUMBER OF SERIAL PORTS	NUMBER OF PARALLEL PORTS	DISPLAY OR PORTABLE	FOOTPRINT (inches)	ON/Off SUPPORT	VERSION OF OS/2 SUPPORT	PAINT-IN/GRAFICS STANDARD	TYPE OF BUSES	SERVICE PROVIDED BY	PRICE
Sierra Ametek, Inc. (800) 933-6911	Super 386/20	None	8.33	DOS, OS/2	640E, 1440E	5120, 16.4M	16	1	1	Desktop	20.5 x 17.4 x 8.5	Yes	No	No	AT	Dealer	\$3,000-\$3,300
	Rusty 37	3.70	4.77, 10	IOS	None	7200, 20M	2	1	1	Portable	13.6 x 12.3 x 3.5	No	No	CGA, EGA	AT	Dealer	\$1,949-\$2,099
Evans Systems, Inc. (800) 634-3282	Torre 286/12, 16, 20, 30	80286	12, 16, 20, 30	DOS, OS/2, Unix	1-16	40-600	Two 3.5", one 5.25"	1	1	Desktop	21.7 x 16.2 x 14.4	Yes	Yes	None	AT	Dealer, Distributor	\$2,000-\$4,000
	Torre 386/16, 20, 30	80386	16, 20, 30	DOS, OS/2	1-16	40-600	Two 3.5", one 5.25"	1	1	Desktop	21.7 x 16.2 x 14.4	Yes	Yes	None	AT	Dealer, Distributor	\$2,719-\$3,719
	AGI Model 1700A, C	80386	16, 17	DOS, OS/2	5120E, 16.4M	6000	Two 3.5", one 5.25", AT	1	1	Desktop	21.7 x 16.2 x 14.4	Yes	Yes	None	AT	Dealer, Distributor	\$1,289-\$1,600
	AGI Model 1800C	80386	16	DOS, OS/2, Unix	1-16	6000	Two 3.5", one 5.25", AT	1	1	Desktop	21.7 x 16.2 x 14.4	Yes	Yes	None	AT	Dealer, Distributor, Third parties	\$1,289-\$1,600
	AGI Model 2000C	80386	20, 25	DOS, OS/2	1-16	6000	Two 3.5", one 5.25", AT	2	1	Desktop	21.7 x 16.2 x 14.4	Yes	Yes	None	AT	Dealer, Distributor	\$1,289-\$1,600
Grid Systems Corp. (415) 585-4770	GridOne 150	None	16	DOS, Unix	1-64	1-1600	None	1	1	Portable	15.0 x 11.8 x 2.2	No	MP	CGA, EGA	AT	Dealer, Distributor, Third parties	\$4,000-\$11,240
	GridOne 200 EDC	80386/20	16	DOS, OS/2, SCO Unix	1-16	1-400	Four 3.5", two 5.25"	1	1	Desktop	21.7 x 16.2 x 14.4	Yes	Yes	CGA, EGA	AT, MCA	Dealer, Distributor, Third parties	\$2,000-\$4,000
	GridOne 200 MC	80386	16	DOS, OS/2	1-16	1-400	Five MC cards	1	1	Desktop	21.7 x 16.2 x 14.4	Yes	Yes	CGA, EGA	AT, MCA	Dealer, Distributor	\$4,000-\$7,447
	GridOne 200 D	80386	12	DOS, OS/2	1-16	1-400	Four MC cards	1	1	Desktop	21.7 x 16.2 x 14.4	Yes	Yes	CGA, EGA	AT	Dealer, Distributor, Third parties	\$2,000-\$5,000
	GridOne 1500	80386	16	DOS, Unix	1-64	1-380	None	0	1	Portable	15.0 x 11.8 x 2.2	No	MP	CGA, EGA	AT	Dealer, Distributor, Third parties	\$3,499-\$9,845
	GridOne 1500 EDC	80386	12.5	DOS, OS/2, Unix	1-64	1-380	Two 3.5", one 5.25"	1	1	Portable	15.0 x 11.8 x 2.2	No	MP	CGA, EGA	AT	Dealer, Distributor, Third parties	\$6,000-\$11,745
Burkett/Packard Co. (800) 733-0060	HP Vectra GS/140	80386/20	14/16	DOS, OS/2, SCO Unix	1-64	40-320	One 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	Yes	Yes	VGA	AT	Dealer, Distributor	\$3,219-\$4,300
	HP Vectra GS/200	80386	16	DOS, OS/2	1-64	40-320	One 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	Yes	Yes	VGA	AT	Dealer, Distributor	\$4,450-\$6,100
	HP Vectra GS/200 ZNC	80386	16, 20	DOS, OS/2	1-64	15-400	One 3.5", one 5.25", 10-80	1	1	Portable	16.7 x 16.4 x 8.5	Yes	Yes	VGA	AT	Dealer, Distributor	\$6,000-\$12,140
	HP Vectra CS	80386	7.16	DOS	640E	80	0	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	VGA	AT	Dealer, Distributor	\$6,000-\$12,300
	HP Vectra EL	80386	6, 12	DOS	640E, 12M	20, 28-80	One 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	Yes	Yes	VGA	AT	Dealer	\$2,199-\$2,495
	HP Vectra LS/12	80386	12	DOS	None	40	None	1	1	Portable	13.7 x 13.2 x 3.1	No	No	CGA, EGA	AT	Dealer	\$4,399-\$5,000
Wyndham Electronics (404) 473-0000	Super 386C	80386	8/16	DOS	640E, 12M, 1-64	1-40	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$1,199
	Super 386V	80386	8/16	DOS	640E, 12M, 1-64	1-40	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$1,199
	Super 386V	80386	8/16	DOS	640E, 12M, 1-64	1-40	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$1,199
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,995-\$4,495
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one 5.25", 10-80	1	1	Desktop	16.7 x 16.4 x 8.5	No	No	None	AT	Dealer	\$2,199-\$3,145
	Super 386C	80386	8/16	DOS, OS/2	1-64	1-370	Four 3.5", one										

COMPANY	PRODUCT	CPU	CLOCK SPEED (MHz)	OPERATING SYSTEM	INTERNAL MEMORY (Megabytes)	DRIVE STORAGE (Megabytes)	NUMBER AND TYPE OF EXPANSION SLOTS	NUMBER OF SERIAL PORTS	NUMBER OF PARALLEL PORTS	DISPLAY OR PORTABLE	FOOTPRINT (inches)	ON/IN REPORT	VERSION OF GA/7 SOFTWARE FOR SYSTEM	MULTI-MU GRAPHICS STANDARD	TYPE OF RAM	SERVICE PROVIDED BY	PRICE
Leading Edge Resources Products, Inc. (800) 343-0525	Leading Edge Model D	8086-2	6.75 7.25	DOS	8128-768K	30	Four 8-bit	One	One	Desktop	14 x 14.5 x 6.5	No	No	MDA, CGA, EGA, MGA, VGA	AT	Dealer	\$850-\$1,200
	Leading Edge Model Z	8086-20	8.10	DOS, OS/2	128-128K	30-65	Two 8-bit, One 16-bit	One	One	Desktop	36 x 25.0 x 8.1	Yes	No	CGA, EGA, MGA, VGA	AT	Dealer	\$1,750-\$2,300
	Leading Edge Model D+	8086-20	8.10	DOS, OS/2	1-8	65	Two 8-bit, One 16-bit	Two	One	Desktop	36 x 25.0 x 8.1	Yes	No	CGA, EGA, MGA, VGA	AT	Dealer	\$2,000
Microdrive Electronics (408) 217-0792	MP200	80286	8.0, 12	DOS, Xenix	640K-1.44M	1-4-43	Four 16-bit, One 8-bit	One	One	Desktop	19 x 19 x 6.1	Yes	Yes	None	AT	Vendor, distributor, third parties	\$1,850-\$1,950
	MP200L	80286	12	DOS	640K-1.44M	1-4-40	Four 16-bit	Two	One	Desktop, portable	12.5 x 14.3 x 3.5	Yes	Yes	None	AT	Vendor	\$3,150-\$5,200
	MP200S	80286	16	DOS	1-10	1-370	Two 22.1K	Two	One	Desktop	22.8 x 25.0 x 4.4	Yes	Yes	None	AT	Vendor, distributor, third parties	\$3,950-\$5,350
	MP200S	80386SX	16	DOS	2-16	1-340	Se 6.1-8.4M	One	One	Desktop	21.5 x 18 x 8.1	Yes	Yes	None	AT	Vendor, distributor, third parties	\$2,950-\$3,950
NEC Corp. (800) 544-3552	HCR PC 430	8086-16	8.10	DOS, DOS/ HCR 380X	640K-16	Up to 110	One 16-bit, one 8-bit	One	One	Desktop	21.0 x 25.5 x 6.1	Yes	No	CGA, EGA, MGA, VGA	AT	Dealer	\$2,400-\$6,200
	HCR PC 450	8086-20	8.10	DOS, DOS/ HCR 380X	640K-16	Up to 110	Eight 16-bit	One	One	Desktop	21.0 x 25.5 x 6.1	Yes	No	CGA, EGA, MGA, VGA	AT	Vendor, distributor, third parties	\$4,000-\$7,700
	HCR PC 450	8086-20	8.10	DOS, DOS/ HCR 380X	640K-16	Up to 227	One 16-bit, one 8-bit	One	One	Desktop	21.0 x 25.5 x 6.1	Yes	No	CGA, EGA, MGA, VGA	AT	Vendor, distributor, third parties	\$6,000-\$14,200
NEC Information Systems (800) 544-3552	HCR PC 470	8086-16	8.10	DOS, DOS/ HCR 380X	3-16	Up to 110	Three 16-bit, one 8-bit	One	One	Desktop	21.0 x 25.5 x 6.1	Yes	No	CGA, EGA, MGA, VGA	AT	Vendor, distributor, third parties	\$1,300-\$4,300
	Power Mac 230/20	80386	20	DOS, OS/2, Windows 3.0, OS/2 Edition	20-380	32-320	Two 32-bit, One 16-bit	Two	One	Desktop	21.0 x 25.5 x 6.1	Yes	Yes	CGA, EGA, MGA, VGA	AT	Vendor, distributor, third parties	\$4,800-\$6,900
	Power Mac 250	80386	20-10	DOS, OS/2, Windows 3.0, OS/2 Edition	3125	HP	Four 16-bit	One	One	Desktop	17 x 19 x 6.1	Yes	Yes	CGA, EGA, MGA, VGA	AT	Vendor, distributor, third parties	\$1,200-\$1,600
Power Mac 200 Plus	Power Mac 200	80386	12	DOS, OS/2, Windows 3.0, OS/2 Edition	3125-140	40-140	Four 16-bit	One	One	Desktop	17 x 19 x 6.1	Yes	Yes	CGA, EGA, MGA, VGA	AT	Vendor, distributor, third parties	\$1,900-\$3,800
	Power Mac 210	80386	8-16	DOS, OS/2, Windows 3.0, OS/2 Edition	3125-140	30-46	Two 8-bit, one 16-bit	Two	One	Desktop	21.0 x 18.5 x 6.1	Yes	Yes	CGA, EGA, MGA, VGA	AT	Vendor, distributor, third parties	\$2,100-\$4,900
	Power Mac 220 Plus	80386SX	16	DOS, OS/2, Windows 3.0, OS/2 Edition	3125-140	30-46	One 8-bit	One	One	Desktop	17 x 19 x 4.5	Yes	Yes	CGA, EGA, MGA, VGA	AT	Vendor, distributor, third parties	\$2,400-\$4,500
Power Mac 230 Plus	Power Mac 230	80386	13	DOS, OS/2, Windows 3.0, OS/2 Edition	3125-140	30-46	Three 16-bit	One	One	Portable	15.5 x 24.5 x 11.2	Yes	Yes	CGA, EGA, MGA, VGA	AT	Vendor, distributor, third parties	\$4,200-\$8,200
	Power Mac 230 Plus/2.0	80386SX	14	DOS, OS/2, Windows 3.0, OS/2 Edition	3125-140	30-46	Three 16-bit	One	One	Portable	15.5 x 24.5 x 11.2	Yes	Yes	CGA, EGA, MGA, VGA	AT	Vendor, distributor, third parties	\$5,000
	Power Mac 230 Plus/2.0	80386SX	14	DOS, OS/2, Windows 3.0, OS/2 Edition	3125-140	30-46	Three 16-bit	One	One	Portable	15.5 x 24.5 x 11.2	Yes	Yes	CGA, EGA, MGA, VGA	AT	Vendor, distributor, third parties	\$5,000
Silicon RA (800) 520-0500	MS200	80386	8	DOS, OS/2	3-30	20-40	Three 8-bit	One	One	Desktop	14 x 18.5 x 6.5	Yes	Yes	CGA, EGA, MGA, VGA	AT	Vendor, dealer	\$2,000-\$3,000
	MS200	80386	12	DOS, OS/2, Windows 3.0, OS/2 Edition	3-34	100	Three 8-bit, One 16-bit	One	One	Desktop	14 x 18.5 x 6.5	Yes	Yes	CGA, EGA, MGA, VGA	AT	Vendor, dealer	\$3,000-\$5,000
	MS200	80386SX	16	DOS, OS/2, Windows 3.0, OS/2 Edition	3-35	40-350	Three 16-bit, One 16-bit	One	One	Desktop	14 x 18.5 x 6.5	Yes	Yes	CGA, EGA, MGA, VGA	AT	Vendor, dealer	\$3,000-\$4,300
MS200-2P1	MS200-2P1	80386	8	DOS, OS/2, Windows 3.0, OS/2 Edition	3-34	90	Three 16-bit, One 8-bit	One	One	Desktop	15 x 18 x 6.5	Yes	Yes	CGA, EGA, MGA, VGA	AT	Vendor, dealer	\$5,000
	MS200-2P2	80386	20	DOS, OS/2, Windows 3.0, OS/2 Edition	3-45	120	Two 8-bit, One 16-bit	One	One	Desktop	16.5 x 20 x 7.5	Yes	Yes	CGA, EGA, MGA, VGA	AT	Vendor, dealer	\$5,200
	MS200-2P2, T-2	80386	20, 30	DOS, OS/2, Windows 3.0, OS/2 Edition	3-45	120	Two 8-bit, One 16-bit	One	One	Portable	17.5 x 20 x 7.5	Yes	Yes	CGA, EGA, MGA, VGA	AT	Vendor, dealer	\$6,000-\$10,700, \$16,000
Precision Ball (800) 733-4432	PB 900	80386	8, 12	DOS, OS/2	40-45	30-40	Two 8-bit	One	One	Desktop	15.5 x 18.5 x 6.5	Yes	No	CGA, EGA, MGA, VGA	AT	Not listed	\$1,400-\$3,000
Precision Ball (800) 733-4432	PB 900/14	80386	8, 12	DOS, OS/2	40	30-40	Two 8-bit, two 16-bit	One	One	Desktop	15.5 x 18.5 x 6.5	Yes	No	CGA, EGA, MGA, VGA	AT	Not listed	\$2,400-\$5,700
Precision Ball (800) 733-4432	Precision Power PC-1000	80386	8	DOS	6000	7000-10000	Five 32-bit	One	One	Desktop	15.5 x 18.5 x 6.5	Yes	Yes	CGA, EGA, MGA, VGA	AT	Not listed	\$1,200-\$1,700
	Precision Power PC-1000	80386	12	DOS	6000	7000-10000	Five 32-bit	One	One	Desktop	15.5 x 18.5 x 6.5	Yes	Yes	CGA, EGA, MGA, VGA	AT	Not listed	\$1,200-\$1,700
	Precision Power PC-1000	80386	16	DOS	6000-40	7000-10000	Five 32-bit	One	One	Desktop	15.5 x 18.5 x 6.5	Yes	Yes	CGA, EGA, MGA, VGA	AT	Not listed	\$1,200-\$1,700
Digital Research Systems (800) 544-0500	DRC-17 Plus	80386	8, 12	DOS, OS/2	3-15	Up to 40	One	One	One	Desktop	12 x 15 x 6.5	Yes	No	CGA, EGA, MGA, VGA	AT	Vendor, dealer	\$1,000-\$2,400
	DRC-18 Plus	80386	16	DOS	3-18	Up to 40	One	One	One	Desktop	12 x 15 x 6.5	Yes	No	CGA, EGA, MGA, VGA	AT	Vendor, dealer	\$2,100-\$3,100

COMPANY	PRODUCT	CPU	CLOCK SPEED (MHz)	OPERATING SYSTEM	INTERNAL MEMORY (Megabytes)	DISK STORAGE (Megabytes)	NUMBER AND TYPE OF EXPANSION SLOTS	NUMBER OF SERIAL PORTS	NUMBER OF PARALLEL PORTS	DEVELOP OR PORTABLE	FOOTPRINT (inches)	CD / SUPPORT	VERSION OF OS / 3 SPECIFIC FOR SYSTEM	BUILT-IN GRAPHICS STANDARD	TYPE OF BUS	SERVICE PROVIDED BY	PRICE
Sierra Sciences Corp. (301) 549-0500	PC-4602	V-40	16	DOS	640K 1.6MB	40	None	1	1	Portable	12.5 x 12.7 x 2.7	No	No	CGA	NP	Vendor, dealer	\$2,199-\$3,599
	PC-4641	V-40	16	DOS	640K 1.6MB	40	None	1	1	Portable	12.5 x 12.7 x 2.7	No	No	CGA	NP	Vendor, dealer	\$2,199-\$3,599
	PC-5541	80386	13	DOS, OS/2	640K 1.6MB	40	None	1	1	Portable	12.5 x 12.7 x 1.4	Yes	No	VGA	NP	Vendor, dealer	\$3,599
Tandon Corp. (1617) 523-0340	386/20	80386	20	DOS	1-16	40-120	Two 8-bit, one 16-bit, one 32-bit	1	1	Desktop	21.1 x 18.5 x 8.3	No	No	CGA	AT	Vendor, dealer, third parties	\$1,899-\$3,149
	386/25	80386	25	DOS	1-16	710-1200	Five 8-bit, one 16-bit, one 32-bit	2	1	Desktop	21.1 x 18.5 x 8.2	No	No	CGA	AT	Vendor, dealer, third parties	\$2,099
	386/30	80386	30	DOS	1-16	110-640	Five 8-bit, one 16-bit, one 32-bit	1	1	Desktop	21.1 x 18.5 x 8.2	No	No	CGA	AT	Vendor, dealer, third parties	\$2,479
	386SX	80386SX	16-32	DOS	1-16	70-80	Four 8-bit, one 16-bit, one 32-bit	1	1	Desktop	12.5 x 18.5 x 8.3	No	No	CGA	AT	Vendor, dealer, third parties	\$1,899-\$2,079
	PCA/12	80386	12	DOS	640K 1.6MB	20-40	Three 8-bit, one 16-bit	2	1	Desktop	18.5 x 16 x 5	No	No	CGA	AT	Vendor, dealer, third parties	\$1,899
	PCA/13-NL	80386	12	DOS	640K 1.6MB	20-40	Three 8-bit, one 16-bit	2	1	Desktop	18.5 x 16 x 5	No	No	CGA	AT	Vendor, dealer, third parties	\$1,499
Tandy Corp. (1617) 520-3611	Tandy 386 TL	80386	8-4	DOS	640K 1.6MB	720K-400M	Five 8-bit	1	1	Desktop	12.5 x 18.5 x 8.3	No	No	CGA	AT	Vendor, dealer, third parties	\$2,299-\$3,722
	Tandy 386 XL	80386	10	DOS, OS/2	512K- 1.6MB	1-16-344	Three 8-bit, one 16-bit, one 32-bit	1	1	Desktop	21.3 x 18.5 x 8.2	Yes	Yes	CGA +, Hercules, EGA	AT	Vendor	\$2,399
	Tandy 4000	80386	18	DOS, OS/2	1-16	1-16-344	Three 8-bit, one 16-bit, one 32-bit, one 30-bit	1	1	Desktop	21.0 x 18.5 x 8.5	Yes	Yes	CGA	AT	Vendor	\$2,999
	Tandy 4000 LX	80386	20	DOS, OS/2	2-16	1-16-344	Three 8-bit, one 16-bit, one 32-bit, one 30-bit	1	1	Desktop	19.0 x 18.5 x 8.5	Yes	Yes	CGA	AT	Vendor	\$4,999
	Tandy 4000 SX	80386SX	18	DOS, OS/2	1-16	1-16-344	Three 8-bit, one 16-bit, one 32-bit, one 30-bit	1	1	Desktop	15.0 x 17 x 8.5	Yes	Yes	VGA	AT	Vendor	\$2,999
	Tandy 4000 MC	80386	20	DOS, OS/2	2-16	1-16-344	Four 8-bit, one 16-bit, one 32-bit, one 30-bit	1	1	Desktop	15.0 x 17 x 8.5	Yes	Yes	VGA	MCA	Vendor	\$4,999
Teletronics Systems, Inc. (404) 949-4233	Teltron II, Model HK	80286	12	DOS, OS/2, Unix, Xenix	1-16	40	Six 8-bit, one 16-bit	2	1	Desktop	NP	Yes	No	CGA	AT	Third parties	\$2,799-\$2,999
	Teltron II-2, Model HK	80286	15	DOS, OS/2, Unix, Xenix	2-16	60	Ten 8-bit, one 16-bit	2	1	Desktop	21.0 x 18.5 x 8.5	Yes	No	CGA	AT	Third parties	\$3,999-\$4,299
	Teltron II-E	80286	18	DOS, OS/2, Unix, Xenix	1-16	180	Ten 8-bit, one 16-bit	2	1	Desktop	21.0 x 18.5 x 8.5	Yes	No	CGA	AT	Third parties	\$2,999-\$3,699
Toshiba America Information Systems, Inc. (404) 457-7777	T1200H and IIB	80386	6.34	DOS	1-2	20	None	1	1	Portable	15.0 x 12.5 x 2.4	No	No	CGA	NP	Vendor, dealer, third parties	\$1,799
	T1200H and FB	80386	4.77	DOS	0-2	720K	2	1	Portable	18.0 x 12.5 x 2.4	No	No	CGA	NP	Vendor, dealer, third parties	\$2,099	
	T3000E	80386	12	DOS, OS/2	1-16	20	None	1	1	Portable	14.0 x 14.0 x 2.3	Yes	No	CGA	AT	Vendor, dealer, third parties	\$4,199
	T3000, T3000-2	80386	6.34	DOS, OS/2	2-16	40	One 8-bit, three 16-bit	1	1	Portable	14.0 x 14.0 x 2.3	Yes	No	CGA	AT	Vendor, dealer, third parties	\$4,499-\$7,499
	T3000, T3000-2	80386	20	DOS, OS/2	2-16	60	Two 8-bit, two 16-bit	2	2	Portable	14.0 x 14.0 x 2.3	Yes	No	VGA	AT	Vendor, dealer, third parties	\$7,499-\$11,299
	T3000	80386	12	DOS, OS/2	1-16	40	Two 8-bit, two 16-bit	2	1	Portable	15.0 x 15.0 x 2.3	Yes	No	CGA	AT	Vendor, dealer, third parties	\$5,299
	T1000	80386	4.77	DOS	0-2	720K-240K	2	1	1	Portable	13.0 x 11.5 x 2.3	Yes	No	CGA	AT	Vendor, dealer, third parties	\$3,699
	T1000	80386	12	DOS	0-2	720K-240K	2	1	1	Portable	13.0 x 11.5 x 2.3	Yes	No	CGA	AT	Vendor, dealer, third parties	\$4,999
	T1000	80386	18	DOS	1-2	90	2	1	1	Portable	13.0 x 11.5 x 2.3	Yes	No	CGA	AT	Vendor, dealer, third parties	\$4,999
	T1000	80386	20	DOS	0-2	320	2	1	1	Portable	13.0 x 11.5 x 2.3	Yes	No	CGA	AT	Vendor, dealer, third parties	\$4,999
Tucson Corp. (404) 457-1424	Personal Workstation Series 3000/1	80386	16	DOS, OS/2	640K 1.6MB	20	None 8-bit	1	1	Desktop	18.0 x 15.7 x 4	Yes	No	CGA	AT	Vendor	\$1,749-\$2,199
	Personal Workstation Series 3000/2	80386	12	DOS, OS/2	640K 1.6MB	40	One 8-bit, three 16-bit	1	1	Desktop	12.0 x 15.4 x 4	Yes	No	CGA	AT	Vendor	\$2,229-\$4,219
	Personal Workstation Series 3000/3	80386	18	DOS, OS/2	1-16	1-2324	Two 8-bit, two 16-bit, four 32-bit	2	1	Desktop	21.0 x 17 x 6.5	Yes	No	EISA	AT	Vendor	\$5,000-\$7,000
Tucson Corp. (404) 457-1424	Personal Workstation Series 3000/4	80386	20	DOS, OS/2	1-16	324	One 8-bit, four 16-bit, four 32-bit	2	1	Desktop	21.0 x 17 x 6.5	Yes	No	CGA	AT	Vendor	\$4,479-\$6,699
	Personal Workstation Series 3000/5	80386	22	DOS, OS/2, SCO XENIX 286	2-16	940	Two 8-bit, two 16-bit, four 32-bit, six 64-bit	2	1	Desktop	21.0 x 18.7 x 6	Yes	No	CGA	AT	Vendor	\$7,319-\$10,499
	PC 2300/18	80386	18	DOS, OS/2, SCO XENIX 286	1-16	1-2395	One 8-bit, four 16-bit, four 32-bit, six 64-bit	2	1	Desktop	18.0 x 18.5 x 6.5	Yes	Yes	CGA	AT	Vendor	\$2,099
Wang Laboratories, Inc. (301) 533-0964	PC 3500/185	80386/2	18-	DOS, OS/2, SCO XENIX 286	5-16	1-2399	One 8-bit, four 16-bit, four 32-bit, six 64-bit	2	1	Desktop	18.0 x 18.5 x 6.5	Yes	Yes	CGA	AT	Vendor	\$2,099

COMPANY	PRODUCT	CPU	CLOCK SPEED (MHz)	INTERNAL MEMORY (megabytes)	DISK STORAGE (megabytes)	NUMBER AND TYPE OF EXPANSION Slots	NUMBER OF SERIAL PORTS	NUMBER OF PARALLEL PORTS	DISPLAY OR PORTABLE	PORTABILITY (points)	CH/3 SUPPORT	VISUALIZATION OR DAY/NIGHT COLOR SYSTEM	MULTI-MEDIA STANDARD	TYPE OF BUSES	SERVICE PROVIDED BY	PRICE
Dell Electronics, Inc.	PC-2000	386	10	320, 640, 1280, 1600, 2000	3-16	300-500, 1K-4K	2	1	Desktop	21.0 x 16.0 x 6.0 6.0	Yes	Yes	Yes	AT	Vendor, dealer, third parties	\$1,200
	PC-2000/16	386	10	320, 640, 1280, 1600, 2000	3-16	1,440-768	3-16	1	Desktop	21.0 x 16.0 x 6.0 6.0	Yes	No	VGA, MCA	AT	Vendor	\$1,600
	PC-2000	386	10	320, 640, 1280, 1600, 2000	3-16	1,440-768	3-16	1	Desktop	21.0 x 16.0 x 6.0 6.0	Yes	Yes	Yes	AT	Vendor	\$1,100
	PC-2000	386	10	320, 640, 1280, 1600, 2000	3-16	1,440-768	3-16	1	Desktop	21.0 x 16.0 x 6.0 6.0	Yes	Yes	Yes	AT	Vendor	\$1,600
West Technology	WT-0114	386	10	40-156	1-16	Five 1.44-, 3.5-	1	1	Desktop	21.0 x 17.0 x 6.0 6.0	Yes	Yes	Yes	AT	Vendor, dealer, third parties	\$2,454-\$7,454
	WT-0106	386	8	40-156	1-16	Five 1.44-, 3.5-	1	1	Desktop	15.0 x 16.0 x 6.0 6.0	Yes	Yes	Yes	AT	Vendor, dealer, third parties	\$1,454-\$1,454
	WT-0112	386	12.8	40-156	1-16	Five 1.44-, 3.5-	1	1	Desktop	15.0 x 16.0 x 6.0 6.0	Yes	Yes	Yes	AT	Vendor, dealer, third parties	\$2,159-\$2,959
	WT-0116	386	16	40-156	1-16	Five 1.44-, 3.5-	1	1	Desktop	15.0 x 16.0 x 6.0 6.0	Yes	Yes	Yes	AT	Vendor, dealer, third parties	\$2,399-\$3,799
Quality Systems, Inc.	Processor 386 Model 100	386SX	4.0	32	300-600	2	1	Portable	18.0 x 15.0 x 6.0 6.0	Yes	Yes	CGA	AT	Vendor, dealer, third parties	\$4,200-\$6,400	
	Processor 386 Model 200	386SX	4.0	32	300-600	2	1	Portable	18.0 x 15.0 x 6.0 6.0	Yes	Yes	CGA	AT	Vendor, dealer, third parties	\$4,200-\$6,400	
	Processor 386 Model 300	386SX	4.0	32	300-600	2	1	Portable	18.0 x 15.0 x 6.0 6.0	Yes	Yes	CGA	AT	Vendor, dealer, third parties	\$7,000-\$11,400	
	Processor 386 Model 400	386SX	4.0	32	300-600	2	1	Portable	18.0 x 15.0 x 6.0 6.0	Yes	Yes	CGA	AT	Vendor, dealer, third parties	\$7,000-\$11,400	
	Processor 386 Model 500	386SX	4.0	32	300-600	2	1	Portable	18.0 x 15.0 x 6.0 6.0	Yes	Yes	CGA	AT	Vendor, dealer, third parties	\$7,000-\$11,400	
	Processor 386 Model 600	386SX	4.0	32	300-600	2	1	Portable	18.0 x 15.0 x 6.0 6.0	Yes	Yes	CGA	AT	Vendor, dealer, third parties	\$7,000-\$11,400	
	Processor 386 Model 700	386SX	4.0	32	300-600	2	1	Portable	18.0 x 15.0 x 6.0 6.0	Yes	Yes	CGA	AT	Vendor, dealer, third parties	\$7,000-\$11,400	
	Processor 386 Model 800	386SX	4.0	32	300-600	2	1	Portable	18.0 x 15.0 x 6.0 6.0	Yes	Yes	CGA	AT	Vendor, dealer, third parties	\$7,000-\$11,400	
	Processor 386 Model 900	386SX	4.0	32	300-600	2	1	Portable	18.0 x 15.0 x 6.0 6.0	Yes	Yes	CGA	AT	Vendor, dealer, third parties	\$7,000-\$11,400	
	Processor 386 Model 1000	386SX	4.0	32	300-600	2	1	Portable	18.0 x 15.0 x 6.0 6.0	Yes	Yes	CGA	AT	Vendor, dealer, third parties	\$7,000-\$11,400	
Apple Computer	Apple II+	6502	1.05	48-128	Times 10-16, 1-16, 256-640, mon 8-16, 320-640	5	1	Desktop	21.0 x 16.0 x 6.0 6.0	Yes	Yes	VGA	AT	Vendor, dealer, third parties	\$1,999-\$7,299	
	Apple IIgs	6502	10	640	Times 10-16, 1-16, 256-640, mon 8-16, 320-640	5	1	Desktop	21.0 x 16.0 x 6.0 6.0	Yes	Yes	VGA	AT	Vendor, dealer, third parties	\$4,999-\$11,499	
	Apple IIcx	6502	10	640	Times 10-16, 1-16, 256-640	5	1	Desktop	21.0 x 16.0 x 6.0 6.0	Yes	Yes	VGA	AT	Vendor, dealer, third parties	\$4,999-\$11,499	

The laptop

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company released a 32-bit, 386-based handheld workstation in August; accompanying radio transceivers are expected to ship by the end of the year. The units, targeted toward field operations, sell from \$2,000 to \$20,000, depending on configuration.

In a related move, the Federal Communications Commission smoothed the way for wireless LANs recently by announcing that it approved a nationwide radio frequency for mobile computer links.

New doings

The coming year will also see color screens on high-end models and the debut of disposable batteries, which may have life spans measured in 10s of hours, analysts say.

Probably the most significant swing factor in the foreseeable future will be market reaction to the long-awaited Apple Comput-

er, Inc. Macintosh portable, which debuted last week.

The jury on the machine is still out, but weighing nearly 16 pounds and priced between \$5,999 and \$6,499, depending on the version, it is much heavier and more expensive than most users would have liked.

Popularity despite price

Yet there are those who think that neither the price nor the weight will matter. According to Shaffer, Apple "won't be able to make enough to keep up with the demand." There are estimates that the company will sell at least 100,000 in the fiscal year beginning Oct. 1.

To sum up the state of the sector, given their current high price and the highly competitive state of the industry, laptops are not expected to flood the market in the near future.

However, with big guns such as Apple and Compaq showing and continuing improvements in functionality, portables will at least be firmly anchored in the personal computer mainstream. *

How the charts work

The Hardware Roundup charts, which begin in the Sept. 18 issue with large, medium-scale and specialized computers, are intended as a guide to the consumer interested in comparing products from major vendors in various size and price classes.

Computers have tried to present complete, accurate listings of as many products as possible by contacting vendors directly for information. Space does not permit including all products or vendors in each category.

Where possible, the parameters used to group computer systems with their likely competitors were defined in the following manner:

- **Small systems** typically support two to 16 users and cost between \$10,000 and

\$100,000.

The category includes machines termed 16-bit microcomputers, and 16- and 32-bit supermicrocomputers and smaller versions of traditional 32-bit superminis and business systems.

• **Personal computers** are defined as single-user machines used primarily in a business setting. These machines are microprocessor-based and general-purpose in nature. They can be programmed in a high-level language and can connect with a variety of peripheral devices to suit users' needs.

For the most part, traditional home-type computers are not included in this classification, in order to limit the large number of CPC offerings. • **Workstations** are single-user systems used primarily

for technical and engineering purposes.

These definitions are general guidelines and cannot be strictly applied in every case. In some cases, it may be difficult to classify a system on the basis of these definitions; the editors have attempted to categorize in a manner consistent with common practice.

Similarly, many who evaluate systems look for a number that indicates how each computer handles a particular well-defined set of tasks.

In the absence of such numbers, the charts include millions of instructions per second — as either provided by the vendor or estimated by CW based on vendor claims — and memory and storage capacities, supplied by vendors in response to a questionnaire.

Workstations dust off after rough year's ride

BY BARBARA FRANCETT

During the last 12 months, the technical workstation arena has been marked by cataclysmic changes among the market leaders and subtle, evolutionary shifts in the market as a whole. In some cases, the effects of the upheavals were positive; in other cases, they leaned toward the negative. In a few instances, the impact is not yet clear. Only one thing is sure: The past is gone, and the playing field is now more level than ever.

The first, bright star Sun Microsystems Inc. faltered, and a powerful new twin star—the merger

of Hewlett-Packard Co.

and Apollo Computer,

Inc.—arose. New

lights from vendors such as Digital Equipment Corp., Data General Corp., MIPS Computer Systems Inc., and Next, Inc. appeared in the competitive constellation.

Intergraph Corp., with its Clipper-based reduced instruction set computing (RISC) workstations, posted a strong performance, moving into the No. 5 slot ahead of Silicon Graphics, Inc., according to Framingham, Mass.-based International Data Corp. (IDC). Tektronix, Inc., gained a position among the top 10 workstation vendors for the first time.

At least one long shadow fell over the market, that of IBM. The company hinted not only at vast power and new enhancements to come for the RT workstation by the end of the year but also an expanded interest in the workstation market as a strategic product segment.

The price/performance wars reached new heights—or depths—as subsequent announcements from DEC, then Sun, then DEC again, countered one another with successively lower entry-level prices. HP and Silicon Graphics also cut prices. However, it appeared that connectivity and functionality might soon displace price/performance as a sparing point.

Undoubtedly the single most significant event of the last year was HP's \$476.4-million acquisition of Apollo in April. The massive sale rocked the industry and, according to some analysts, instantly vaulted HP into the No. 1 market share slot, displacing longtime leader Sun.

Analysts view the move as favorable for both companies, although not without pitfalls.

"It's a good fit for both companies," says Jim Hammons, manager of Technology Advisory Services at The Sierra Group, Inc., based in Tempe, Ariz. "Apollo had good products, innovative technology and some of the best networking protocols around. HP gained all that plus a significantly larger installed base. Apollo got HP's reputation for support and service, where before, they did not have the wherewithal to keep their accounts happy."

Others took a less sanguine view. "User concern and confusion over which

product lines will be dropped and which ones will be supported are likely to translate into lost business for HP," notes Vicki Brown, director of systems research at IDC.

Melding two product lines will take a long time, points out Kathleen Hurley, workstation industry analyst at Dataquest, Inc. in San Jose, Calif. "Right now, they're supporting three architectures. That's hard to do." Also, there's the issue of East Coast/West Coast mentalities. They need to blend their cultures, and they haven't done that yet," she says.

Indeed, HP posted a slight loss in third-quarter earnings. For the fiscal quarter ending July 31, profits were down 2.6%. Although HP attributed the drop to slow sales on the minicomputer side, analysts point the finger at an unusual product mix.

Nevertheless, the merger represented an irresistible trend in the workstation segment. The market is maturing, evolving from a proving ground for bright young start-ups with technological wherewithal to a battleground for computer industry giants with broad product lines and manufacturing and manufacturing resources, to spare.

"DEC and IBM set out the major growth phases of the first few years. Now they'll come into the market with a full strategy of competing for market share with aggressive pricing," says George Weiss, program director of midrange systems at Gartner Group, Inc. in Stamford, Conn. "The market is large and can contribute significantly to a large-system company's revenue. As the competitive situation becomes more intense, it drives down prices. This puts more pressure on companies less equipped to provide a broad base of services."

Diluting Sun?

Such an evolution may well mean a continued decline for Sun, which suffered a loss this year. "If major players HP/Apollo, DEC and IBM merge in the next few months, Sun may find itself taking a backseat for the first time since the technical workstation market began several years ago."

"Sun would like to see workstations become like PCs—low-cost and mass-produced for a mass market," Weiss says. "They'd like the Sparc architecture accepted as a standard. The downside is that they might give away the low end of the market to lower cost, higher volume manufacturers."

Moreover, "Sun could have a difficult time at the high end," Weiss continues. "They're not known for a high-performance product, whereas HP and DEC have the potential to exploit the high end. Under Sun direction, new technology that significantly advances the state of the art, they'll have a tough time."

Sun, however, has already withdrawn

several bad breeds and managerial miscalculations with little sign of slowing down

Continued on next page

Workstation monthly

October: Steve Jobs announces that the Next computer is available to universities at \$4,500. Silicon Graphics offers its high-end Iris Power series and the low-end 3-D Personal Iris.

November: Five semiconductor vendors form the Sparc Vendor Council to promote Sun's Sparc RISC architecture as an industry standard and give it some distance from Sun.

January: DEC announces three Vaxstations and a RISC-based, 32-MIPS workstation, the Decstation 3100. Sun-compatible vendor Software Computer rolls out with the Series 4100.

February: IBM hints that the RT—and AIX—will take on a more important role in its workstation strategy; however, no enhancements are expected before the fall. MIPS Computer Systems enters the workstation arena by announcing the entry-level RS 2030 workstation based on the same processor as in DEC's Decstation 3100. Data General announces five

RISC-based workstations models based on Motorola's 88000 chip set.

April: Sun's introduction of the 12.5-MIPS Sparcstation 1 is completely overshadowed by Hewlett-Packard's purchase of ailing Apollo Computer. Next announces it will sell its machines to businesses at \$9,995—a 35% increase over its cost to academics.

May: Sun persists in its efforts to spread the gospel according to Sparc and announces that Sparc-based PCs will be available from Toshiba.

June: A computer spin-off at Sun brings its business operations to a virtual standstill.

July: DEC introduces the Decstation 2100, an entry-level RISC workstation, which positions it as a competitor to Sun's Sparcstation 1. HP announces it will license its RISC architecture.

August: Sun announces a fourth-quarter loss of \$20.3 million. Bitter and Ardent announce their merger.

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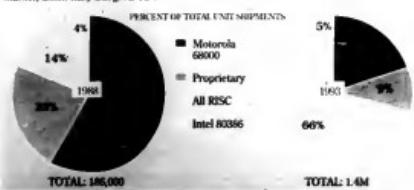


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Balance of power

In the next five years, RISC-based workstations will see the greatest growth in the workstation market, which itself will grow 75%.

**Workstations**
FROM PREVIOUS PAGE

in its drive to establish the Scalable Processor Architecture (Sparc) RISC chip set as an industry standard and spread the workstation gospel to the commercial masses. In April, just as it was about to begin marketing its much-anticipated Sparcstation line—including the \$8,995, 12-MIPS Sparcstation 1—the HP and Apollo dropped their merger bomb, effectively stealing Sun's thunder.

Then in June, Sun revealed that a major in-house computer and Sun had stalled not only orders for new machines but outstanding orders for existing products. Sun Chief Executive Officer Scott McNealy

conceded that in the aftermath, Sun could suffer its first losing quarter ever.

That prophecy fulfilled itself in August, when Sun reported a loss of \$20.3 million for the fiscal fourth quarter ending June 30, despite an 18% increase in revenue from \$365.1 million to \$431.2 million. Moreover, the company says a return to profitability in the next quarter is uncertain.

Some analysts claim it was just a matter of time—Sun had been moving too fast for too long. Others view the setback as temporary.

"What happened with Sun didn't surprise us at all," Hammons says. "But it's not as bad as some analysts predict. Sun will find a way to survive and compete. They have strong products. They won't continue to be a dominant force as the market matures, but there will be plenty to go around."

Brown says she believes that, barring any major foul-ups, Sun will still be the revenue and market share leader through this year. But for 1990 and beyond, Sun may need to turn to IBM/APollo and, eventually, IBM," she adds.

Sun may need to broaden its scope still further to compete as those three leaders become more aggressive. "Workstations were originally designed for independent users, but now there's more of a need to share resources across the corporation," Hurley points out. "Companies like IBM, HP and DEC, with their wider product lines, can play more of a role. Sun needs to look at the corporate computing environment. So far, they've only addressed that in a small way."

Big guys' game

The growing interest of major computer vendors in the workstation market further emphasizes the importance of natural allies. DEC has certainly set its sights on gaining a larger piece of that market and set out to prove it with a barrage of announcements in January and July.

January's introductions included DEC's first RISC-based machine, the 14-MIPS Decstation 3100, priced at \$11,900. In July, DEC beefed up its RISC offerings with several additions and squarely targeted the Sparcstation 1 with the low-end 10.4-MIPS Decstation 2100, priced at \$7,950.

"DEC considers Sun its major competitor," Brown says. "The real test of DEC's workstation success is in Unix-based workstations."

DEC's RISC workstations are based on chips from Mips Computer Systems. Not wanting to be left out, Mips introduced several new RISC-based machines in February, including an entry-level workstation, the 12-MIPS RS2030, priced at \$17,000. Although not a major player, Mips Computer may be successful with its foray into the market by virtue of its relationship with DEC, according to some analysts.

DEC was not the only industry heavy hitter to take an aggressive crack at the workstation market. In February, Data General Corp. introduced the Avine line, based on Motorola, Inc.'s 88000 RISC chip set. It included five workstations ranging from \$7,450 to \$14,995 and pricing at \$17,200 MPPS.

DEC has a "chance," according to Patrick Johnson, director of sales and marketing in the computer markets division at IMS America Ltd., in Plymouth Meeting, PA. "They're not really newcomers; *Continued on page 50*



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Workstations

COMPANY	PRODUCT	CPU	OPERATING SYSTEMS	MICROSOFT-DOS SUPPORTED BY	PERFORMANCE [MIPS ¹]	CO-PROCESSOR SUPPORT	MAIN MEMORY (megabytes)	NUMBER AND TYPE OF ADD-IN MEMORY SUPPORT	STORAGE (megabytes)	MASS STORAGE DISK CONTROLLER	USB INTERFACE SUPPORTED	TYPES OF NETWORKS SUPPORTED	COLOR OR MONOCHROME	GRAPHICS STANDARDS SUPPORTED	PRICE
Advanced Logic Devices (408) 644-4287	Power Plus 200	80386	DOS, OS/2, Unix, VMS	Software and hardware co-processor	1.9	Math	2.38	NP	40	Embedded AT controller	None	Apple, EtherTalk, Token-Ring	Both	ECA, VGA	\$1,495
	Power Cache SX 3002	80386	DOS, OS/2, Unix, VMS	Software and hardware co-processor	3.4	Math	512K-3MB	NP	40	Embedded AT controller	None	Apple, EtherTalk, Token-Ring	Both	ECA, VGA	\$1,720-\$4,195
	VIP SX300, 10 MHz	80386	DOS, OS/2, Unix, VMS	Software and hardware co-processor	3.4	Math	512K-3MB	NP	Up to 40	Embedded AT controller	None	Apple, EtherTalk, Token-Ring	Both	ECA, VGA	\$1,495-\$3,995
	VIP 12000	80386, 12.8 MHz	DOS, OS/2, Unix, VMS	Software and hardware co-processor	NP	NP	512K-3MB	NP	Up to 40	Embedded AT controller	None	Apple, EtherTalk, Token-Ring	Both	ECA, VGA	\$1,795-\$3,895
Agile Corp. (415) 963-0440	Agile Systems Workstation Workstation	80386	DOS, OS/2, Unix	NP	4	Math	1.6	3D Acceleration	Up to 80	S3 3Dfx	Workstation, graphics, touch screen	Both	Super VGA	\$4,000-\$20,000	
AT&T (800) 247-1212	6300/6320 Models 3111, 3114	80386	DOS, OS/2, Unix	NP	6.9	Math	4-40	32MB memory	60-380	EISA	Open Local Bus, S3, Token-Ring	Color	Super VGA	\$8,000-\$25,000	
Compaq Computer Corp. (713) 923-0000	3800, 4400	80386, 32 MHz	Stand-Alone Client	NP	7.54	Floating point	0-120	8M-32M	147MB	EISA, SCSI	NP	TCPIP, DECnet, AppleTalk, EtherTalk, Token-Ring	Color	EISA, 32-bit, CIX	\$19,000-\$20,000
Control Data Corp. (403) 863-8188	Cyber 810-630 series	MC68020, 32 MHz	Software co-processor	32-80	Floating point	0-128	NP	340-1100	SCSI, SCSI	EISA	TCPIP, DECnet, AppleTalk, EtherTalk, Token-Ring	Color	EISA, 32-bit, CIX	\$80,000-\$100,000	
Cyber 810-650 series	MC68020, 32 MHz	NP	5-14	Floating point	0-144	NP	340-1100	SCSI, SCSI	EISA	TCPIP, DECnet, AppleTalk, EtherTalk, Token-Ring	Color	EISA, 32-bit, CIX	\$84,000-\$87,000		
Cyber 810-660 series	MC68020, 32 MHz	NP	50-100	Floating point	0-120	NP	340-1100	SCSI, SCSI	EISA	TCPIP, DECnet, AppleTalk, EtherTalk, Token-Ring	Color	EISA, 32-bit, CIX	\$84,000-\$87,000		
Dataram Corp. (403) 666-1370	Valentine/EL2 Model 3800/3900, 21.08	80386	DOS, OS/2, Unix	Proprietary	4.7	Intel 80387	0-18	16-bit/32-bit processor slot, 16-bit memory slot, 32-bit memory slot	1,400-8,000	SCSI	IDE, removable keyboard	Color	Apple, VGA + VESA, Macintosh, PC/AT, PC/ATPL, 3+, DECnet, Ethernet, Token-Ring	\$8,350	
Delco Electronics Corp. (800) 344-4282	Marine/EL2 Model 3800/3900, 21.08	80386	DOS, OS/2, Unix	Proprietary	2.7	Intel 80387/12	2-8	16-bit AT bus	1,400-8,000	SCSI	IDE, removable keyboard	Color	Apple, VGA + VESA, Macintosh, PC/AT, PC/ATPL, 3+, DECnet, Ethernet, Token-Ring	\$8,750	
Data General Corp. (800) 320-3438	AV3, 300	Motorola 68000, 20 MHz	80386	Software co-processor	17	Floating point	0-20	Up to 7.4MB extra memory	179MB	SCSI	CP/M/OS	TCPIP	Both	DECnet, Macintosh, PC/AT, PC/ATPL, 3+, DECnet, Ethernet, Token-Ring	\$7,400-\$21,400
AV3.300	Motorola 68000, 20 MHz	80386	80386, 20 MHz	80386	17	Floating point	0-20	Up to 7.4MB extra memory	179MB	SCSI	CP/M/OS	TCPIP	Both	DECnet, Macintosh, PC/AT, PC/ATPL, 3+, DECnet, Ethernet, Token-Ring	\$11,000-\$20,000
AV3.310	Motorola 68000, 20 MHz	80386	Software co-processor	20	Floating point	0-20	Up to 7.4MB extra memory	179MB	SCSI	CP/M/OS	TCPIP	Both	DECnet, Macintosh, PC/AT, PC/ATPL, 3+, DECnet, Ethernet, Token-Ring	\$11,000-\$20,000	
AV3.310C	Motorola 68000, 20 MHz	80386	Software co-processor	25	Floating point	0-25	Up to 7.4MB extra memory	179MB	SCSI	CP/M/OS	TCPIP	Both	DECnet, Macintosh, PC/AT, PC/ATPL, 3+, DECnet, Ethernet, Token-Ring	\$14,000-\$25,000	
Digital Equipment Corp. (800) 344-4282	Decstation 2100	MEPS/21000, Ultra 21	80386	Software co-processor	17.6	FPU, RISC	0-16	480 MB fast memory	179MB	SCSI	Decstation	DECnet, Ethernet, Token-Ring, LAT, TCP/IP	Both	DEC, PC/AT, PC/ATPL, 3+, DECnet, Ethernet, Token-Ring, LAT, TCP/IP	\$7,950
Decstation 2100 workstation	MEPS/21000, Ultra 21	80386	Software co-processor	3-14	FPU, RISC	0-24	old fast memory	179MB	SCSI	Decstation	DECnet, Ethernet, Token-Ring, LAT, TCP/IP	Both	DEC, PC/AT, PC/ATPL, 3+, DECnet, Ethernet, Token-Ring, LAT, TCP/IP	\$11,360	
Decstation 2100	CMOS Microvax	VME, Ultra 16	Software co-processor	3-4	FPU	0-32	48M-128M Ultra 16-bit memory	Ultra 16	SCSI	Decstation	DECnet, Ethernet, LAT, TCP/IP	Both	DEC, PC/AT, PC/ATPL, 3+, DECnet, Ethernet, Token-Ring, LAT, TCP/IP	\$7,950	
Decstation 2100	CMOS Microvax	VME, Ultra 32	Software co-processor	3-4	FPU	0-16	old fast memory	Ultra 32	SCSI	Decstation	DECnet, Ethernet, LAT, TCP/IP	Both	DEC, PC/AT, PC/ATPL, 3+, DECnet, Ethernet, Token-Ring, LAT, TCP/IP	\$8,120	
Decstation 3500	CMOS Microvax	VME, Ultra 32	Software co-processor	3-4	FPU	0	16-bit increments	179MB	SCSI	Decstation	DECnet, Ethernet, LAT, TCP/IP	Both	DEC, PC/AT, PC/ATPL, 3+, DECnet, Ethernet, Token-Ring, LAT, TCP/IP	\$11,310	
Decstation 3500	CMOS Microvax	VME, Ultra 32	Software co-processor	3-4	FPU	0	16-bit increments	179MB	SCSI	Decstation	DECnet, Ethernet, LAT, TCP/IP	Both	DEC, PC/AT, PC/ATPL, 3+, DECnet, Ethernet, Token-Ring, LAT, TCP/IP	\$11,310	
Western/Piedmont Co., Apollo Division (408) 666-0005	Series 2000 personal workstation	MEPS/12.0 MHz	Dynetics/OS	Software and hardware co-processor	1.5	Floating point	4-8	NP	72-240	EISA	Dynetics Model, Dynetics III	Both	Plug, GES	\$8,495-\$27,200	
Series 1000	MEPS/12.0 MHz	Dynetics/OS	Software and hardware co-processor	22	Floating point, NP	8-128	NP	32MB-1.3G	EISA, SCSI	Dynetics Model, Dynetics III	Both	Plug, GES	\$8,495-\$22,400		
Series 1000 personal supercomputer	MEPS/12.0 MHz	Dynetics/OS	Software and hardware co-processor	32	Floating point, NP	8-128	NP	32MB-1.3G	EISA, SCSI	Dynetics Model, Dynetics III	Both	Plug, GES	\$8,495-\$22,400		
Series 2000 personal supercomputer	MEPS/25 MHz	Dynetics/OS	Software and hardware co-processor	4	Floating point	4-32	32-bit	155-487	EISA	Dynetics Model, Dynetics III	Both	Plug, GES	\$16,495-\$28,100		
Series 3000 personal supercomputer	MEPS/32 MHz	Dynetics/OS	Software and hardware co-processor	7	Floating point	8-32	NP	155-487	EISA	Dynetics Model, Dynetics III	Both	Plug, GES	\$11,895-\$24,800		

¹Million of instructions per second.

The companies included in this chart responded to a recent telephone survey conducted by *Computerworld*. When a vendor is unable to provide specific information about its product, the abbreviation NP (not provided) is used. When a question does not apply to a vendor's product, the abbreviation NA (not applicable) is used. Further product information is available from the vendors.



AI&T Computers have
Burlington Northern Railroad
customers raving about service.

AI&T
Computers

Denver, Colorado
May 2, 1989

The Burlington Northern National TrackSmart® Center is getting rave reviews from its customers. And AT&T's distributed networked computer solution behind it is getting rave reviews from Burlington Northern. Burlington Northern's Lonnie Jarrell tells AT&T's Chris Turnquist why AT&T Computers provide a better way to serve customers of the longest railroad in the country.

Lonnie: We want to be known for superior customer service. So we planned proactive shipment monitoring through a new customer service concept—the National TrackSmart Center.

Chris: And better customer service means getting information to your customers, in *their* reporting format, as soon as your reps have it.

Lonnie: Exactly. All we had to do was listen to our customers to understand their transportation information needs. That was plenty of inspiration. We knew then that we needed a system that would let our reps instantly locate cars and report shipment status to customers immediately.

Chris: I remember when your reps could only handle one customer at a time. They had to query the mainframe database car by car. And *then* manually record their findings and send them out. Now each rep can handle up to ten customers, right?

Lonnie: Absolutely, plus the rep has more time to serve his customers better. Now they save time by tracking every car from *one* CRT. The AT&T 6500 Multifunction Communications System gives them multi-window

access to two synchronous sessions on our host, as well as sync access to the TrackSmart application and AT&T Mail. Both TrackSmart and AT&T Mail run concurrently on the AT&T 3B2/1000 Computer. So the reps get information the second they need it.

Chris: And you're able to tap information easily.

Lonnie: Right. Because you molded AT&T distributed networked computing to fit the Burlington Northern, rather than the other way around. You provide it all—computer networking systems and communications expertise. Plus you blend it all together with other systems better than any company I've ever seen.

Chris: I understand one customer wrote a BN rep promising him an official company ID naming him their Assistant Transportation Manager.

Lonnie: That's true. But you know, if we're going to be a partner to our customers, we have to be a partner with vendors who can take us in that direction.

The Burlington Northern
Computer Solution

Your Computing Systems
and Networking
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AT&T
Computer Systems

The AT&T 3B2/1000 Computer. It's not just working on the railroad.

Whether you're into networking, office automation, software development, or anything in between, one thing is certain. You've just found the ultimate in distributed networked computing.

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For instance, you can quickly and affordably go from 5 to 16 MIPS with multiple processing elements to more efficiently balance the system workload. And put distributed departmental computing a lot closer to your frontline users. What's more, you can add up to a full 15.9 GB of storage. As well as up to 64 MB of memory—perfect for massive



The AT&T 3B2/1000 and 615 CMT provide simultaneous interaction with multiple applications.

database applications, file sharing and networking demands.

And speaking of networking, the 3B2 gives you quite a long list of options. It can provide a bridge between open and closed computing platforms from a variety of vendors. Not only to help preserve your system investments, but strengthen them as well. Plus, it's great in wide-area connectivity environments. Or when you rely on heavy background processing like database management. Or *anytime* when accessing huge amounts of data or high availability is essential.

Now add the new Release 3.2.2 of UNIX® System V to the 3B2 and watch operating system performance soar. Together, they too protect investments. And they give you applications portability—just two more examples of the 3B2's price-performance superiority.

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AT&T
Computer Systems

Three forces govern small-systems market

BY PETER S. SCHAY

Although the small-systems market has rebounded in the last year, the good fortune was by no means universally shared.

IBM's Application System/400 — with half of the more than 50,000 shipped falling into the small-systems category — paced the market, boosting IBM's small-systems revenue a whopping 36%. Digital Equipment Corp. held onto the No. 2 slot in the small-systems business, showing disappointing growth in spite of a flood of new products. Hewlett-Packard Co. also benefited, as its reduced instruction set computing (RISC) HP 3000 Models 925 and 835 systems kicked into high gear.

SMALL SYSTEMS

The other big names in small systems, including Unisys Corp., NCR Corp., Wang Laboratories, Inc., Prime Computer, Inc., and Data General Corp., did not fare as well, however, with Wang and DG actually showing negative growth.

These changes illustrate the convergence of the small-systems market around three centers of gravity: IBM, DEC and Unix. This convergence enables — if not requires — users to view the selection of small systems in terms of architectures, not products.

In the IBM environment, this means Systems Application Architecture, whether on the AS/400 or an IBM 9370 running VM. In the DEC environment, this means MicroVax running VMS today, with Network Application Support (NAS) paving the way for integration of RISC-based DEC systems in the future.

Most important, in the Unix environment, it means vendor-independent standards such as the X/Open Common Application Environment, rather than a particular implementation base such as AT&T's Unix System V, backed by Unix International, Inc. (UII), or Open Software Foundation's OSF/1 implementation.

Slow to innovate

Recognizing that users are becoming increasingly reluctant to introduce new proprietary architectures in their organizations, this limits vendors' ability to grow beyond their current customer bases with existing proprietary architectures, forcing them instead to introduce Unix products for new customers and reinforce the Unix trend. Vendors such as NCR Corp., Unisys and HP, already shipping Unix systems, are benefiting from this trend.

With more users seeking out Unix, not even DEC and IBM are immune, as witnessed by the RISC-based, Unix-only Decsystem 3100 and 5400 and the imminent IBM RT multiuser configuration. Nonetheless, the majority of IBM and DEC small-systems customers are likely to continue buying the companies' proprietary systems well into the 1990s.

While the AS/400 turned in a stellar

performance on the strength of pent-up demand from System/36 users, IBM moved to reinforce its disappointing 9370 product line with the April introduction of the IBM 9373 Model 25, priced from \$26,250.

Offering significantly higher performance than the Models 20 and 40 it re-

placed, the Model 25 improved the 9370's price/performance relative to competitive Microvax and Unix systems. IBM also enhanced the performance of the 9370 Model 50 by 26%, providing free upgrades for previously installed Model 50s in the bargain.

IBM also countered competitive benchmark claims from DEC and HP by publishing audited Debit-Credit results in October using the RAMP-C (Rapid Approach to Measurement Performance Code) proprietary benchmark results in July. The latter report includes a technical description of RAMP-C to help establish its credibility.

While DEC may have disappointed Wall Street, it certainly did right by small-systems users. It introduced the Micro-

vax 3300 and 3400 in October, Decsystem 3100 in March, Microvax 3800 and 3900 in April and Microvax 3100 and Decsystem 5400 in July. With prices plunging as low as \$1,500 per millions of instruction per second (MIPS), DEC signaled the industry that the era of DEC maintaining a price umbrella for small systems — as IBM does for large systems — was over.

DEC also added fuel to the Unix fire, as the new Decsystems, based on the Mips Computer Systems Inc. RISC chips, run only Ultrix, DEC's version of Unix, not VMS. In doing so, DEC undermined its "one architecture, one operating system" marketing message, highlighting the importance of its NAS strategy for the future integration of VMS and Ultrix

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systems that are networked to MS-DOS, Apple's Macintosh and OS/2-based PCs.

Not surprisingly, Unix announcements continued unabated from the year before, as performance levels offered by commercial microprocessors from Intel Corp., Motorola Inc. and Micro Computer Corp. toward the 20-MIPS mark.

Unisys, which has targeted the Unix market as a long-term growth opportunity to offset its softening large-system business, introduced an entry-level Intel 80386-based U86000 Model 30, priced from \$11,500. The Unisys Network Computing Group — formerly called Convergent Technologies — also filed in its Motorola 68020-based S series with the S/480.

Likewise, NCR Corp., which pioneer-

THE IDEA OF price/performance wars between IBM and DEC in the Unix market is enough to give financially weaker vendors nightmares.

ed the entry of major computer vendors into the small Unix system business with its Tower product line, just introduced the Motorola 68030-based Tower 32/700 for 32 to 64 users. Coming up from the PC space, Zenith introduced the Z-1000, a multiprocessor Unix system containing up to six 386s, with prices starting around \$20,000.

It was DEC and DG, however, which set the pace in small-system price/perfor-

mance positioning, using RISC-based products. Although DG's Motorola 88000-based Avion products are currently configured as workstations, not small systems, DG has made no secret of its intent to phase in the Avion family as its new mainstream product line. With Avion server prices starting at less than \$600 per MIPS, DG seems to be well positioned on a price/performance basis.

Looking ahead, the key question is

how aggressively IBM will price the multiuser configurations of the long-awaited 30 MIPS replacement for the RT. Just the idea of Unix price/performance wars between IBM and DEC is enough to give financially weaker vendor nightmares.

Vendors tend to their own

While RISC and Unix may be the wave of the future, vendors by no means have ignored their existing proprietary system user bases.

Unisys brought its proprietary A series mainframe architecture and MCP/AS operating system down into the small-systems space with the introduction of the Micro A. Its \$20,365 entry price makes it very attractive to running A series customers in need of development systems or distributed applications. But analysts doubted whether the Micro A would attract much interest outside the Unisys customer base.

Meanwhile, Bull H. N. Information Systems, Inc., looking to expand its proprietary DPS 7000 presence from Europe to the U.S., introduced the DPS 7000/200 series, starting with the DPS 7000/230 at \$46,000.

Among traditional small-systems vendors, Prime introduced the 2850, an entry-level member of its proprietary 50 series. Supported by the Primos operating system and the Primo Information Picket database/4GL, prices for the 2850 start at \$46,660. Unfortunately for Prime, its long-running battle to prevent a takeover by MAI Basic Four, Inc., seemed to capture more attention than its products.

DG continued to emphasize price/performance for its MV users with the introduction of the 3 MIPS MV/15000S Model 8, which handles disk and tape drives in its \$90,700 base price. DG has pledged continued support for its proprietary MV customer base, as it has supported the Nova base, while it shifts its primary focus to the RISC-based Avion line for future growth.

Where've you bin?

Arguably, the most innovative new machine is the Bin 20, the outgrowth of a joint venture between Siemens AG and Intel. Similar to RISC machines, the Bin 20 execute many instructions in a single cycle, but the overall architecture is more reminiscent of the highly micro-coded AS/400.

The Bin operating system, written in Ada, is object-oriented and provides a high degree of software fault tolerance, while the Bin 20's hardware organization provides Stratus-like hardware fault tolerance. Although the internal design of the operating system is entirely new, the application programming interface complies with Posix, enabling users to view it as a fault-tolerant Unix. It remains to be seen how well the market will accept Bin, but the product looks like a winner, and Siemens and Intel have deep enough pockets for a serious try.

Although the AS/400 led the rebound in the small-systems market, user attention continues to shift to Unix and RISC, two factors that will come to dominate the small-systems market. IBM and DEC will continue to do well, as will Unix system vendors who stay up on the price/performance front. However, others such as DG and Wang, will have to pay close attention to what is going on around them if they are to survive. *

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— John Turanjan
Chairman
Cornell Computer Corp.

Cornell Computer Corp., based in Long Island, N.Y., with 15 offices in the East, West and Southwest, provides consultant services to the nation's MIS departments. The company also specializes in training seminars and courses and software maintenance on a 24-hours-a-day basis.

But Cornell considers the quality of its consultants to be the company's greatest asset, says Chairman John Turanjan. That's why, he notes, when it comes to recruiting consultants, Cornell turns to Computerworld's Computer Careers pages.

"We recruit nationally. Our goal is to hire highly qualified people as a direct result of our ads. If we can't find one consultant from an ad, we still save money over other methods, so naturally, we concentrate on print advertising."

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tag that's at least 25% smaller.

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Toshiba America Information Systems Inc., Computer Systems Division

Small systems

VENDOR	PRODUCT	DATE FIRST INSTALLED AT CUSTOMER SITE	NUMBER CURRENTLY INSTALLED	PRIMARY MARKET	HIGH-COMPATIBLE MAINFRAME SYSTEM	PERFORMANCE (MIPS*)	MACHINE CYCLE TIME (nsec)	NUMBER RANDOM REQUESTS/SEC	DISK TRANSFER RATE (Megabytes/sec.)	DISK CAPACITY (Megabytes)	NUMBER OF PORTS	PROCESSOR TYPE	OPERATING SYSTEMS	MAXIMUM NUMBER OF USERS	TYPICAL NUMBER OF USERS	WORD LENGTH (bits)	PRICE	DISTRIBUTION
Advanced Logic Systems Inc.	Model 1000	NP	NP	DP, SE	NP	8,000	NP	3-18	NP	NP	1	AT	MS-DOS, OS/2, Unix, VMS, Xenix	100	70 per server	64	\$8,400 with 256 bytes RAM; 1,200 bytes disk, 1,200 bytes memory, 1,200 bytes cartridge tape.	Dealer, VAR
	Plus Color 2000	NP	NP	DP, SE	NP	8,154	NP	3-18	NP	NP	2	AT	MS-DOS, OS/2, Unix, VMS, Xenix	100	70 per server	54	\$8,400 with 256 bytes RAM; 1,200 bytes disk, 1,200 bytes memory, 1,200 bytes cartridge tape.	Dealer, VAR
	Plus Color 3000	NP	NP	DP, SE	NP	7,854	NP	3-18	NP	NP	2	AT	MS-DOS, OS/2, Unix, VMS, Xenix	100	70 per server	52	\$8,400 with 256 bytes RAM; 1,200 bytes disk, 1,200 bytes memory, 1,200 bytes cartridge tape.	Dealer, VAR
	Plus Color 3500	NP	NP	DP, SE	NP	8,671	NP	3-18	NP	NP	2	AT	MS-DOS, OS/2, Unix, VMS, Xenix	100	70 per server	52	\$8,400 with 256 bytes RAM; 1,200 bytes disk, 1,200 bytes memory, 1,200 bytes cartridge tape.	Dealer, VAR
Airon Computer Systems	Airon 2000 Series 2000	NP	NP	DP, GA	NP	3.5	NP	3-18	1	40-200	2-18	80386	Airon Novell V1.0, V2.0	18	1-4	22	NP	OCM, OEM, VAR
	Airon 2000 Series 2000 Model 2000	NP	NP	DP, GA	NP	3.8	NP	4-18	10	90-580	Up to 20	80386	Airon Novell V1.0, V2.0	122	21-64	32	NP	OCM, OEM, VAR
	Airon 3000 Series 1000	NP	NP	DP, GA	NP	4	NP	4-24	10	90-720	8	80386	Airon Novell V1.0, V2.0	77	9-32	32	NP	OCM, OEM, VAR
	Airon 3000 Series 1000 Model 1000	NP	NP	DP, GA	NP	4.5	NP	4-24	10	130-780	8	80386	Airon Novell V1.0, V2.0	77	9-32	32	NP	OCM, OEM, VAR
	Airon 6422 Series 6200	NP	NP	DP, GA	NP	NP	NP	4-18	10	90-280	Up to 20	80386	Pick	128	11-64	32	NP	OCM, OEM, VAR
Applied High-End Systems	Master 6000 Model 6100	Oct. 1986	1,400	DP, GA	AS/400, Microvax	NP	NP	3-18	4.8	14G	18-294	CISC	Master OS/2	254	60	20	\$34,500 with 720 bytes memory, 2400 bytes disk, 1200 bytes cartridge tape, 16 ports	OCM, VAR
	Master 6000 Model 6110	Feb. 1987	1,200	DP, GA	AS/400, Microvax	NP	NP	3-6	4.8	11G	9-128	CISC	Master OS/2	139	30	22	\$34,500 with 720 bytes memory, 2400 bytes disk, 1200 bytes cartridge tape, 16 ports	VAR
Aria Corp.	Aria 800 Model 871	Jan. 1986	3,246	DP, GA, TP	ES/300, ES/310, ES/320, ES/330, ES/340, ES/350	4.3-11.5	81	8-64	2-64	NP	528	CISC, 80486	User Systems V	339	63-80	32	\$42,000-87,000	OCM, VAR
	Aria 800 Model 872	Jan. 1987	1,329	DP, GA, TP	ES/300, ES/310, ES/320, ES/330, ES/340, ES/350	4.3-8.4	81	8-64	2-64	NP	528	CISC, 80486	User Systems V	60	14-66	32	\$21,000-83,000	OCM, VAR
AT&T	3300/3400/3500	NP	NP	DP, GA, TP	MS/RT, Model 3000, 3100, 3200, 3300, 3400, 3500	5-10.8, 8.5-12.5	NP	10-64	3	900M-15.9G	NP	WE, 323200	User Systems V	481,100 (Model 35)	50	20	\$20,000-100,000 bytes memory, 100,000 bytes disk, 100,000 bytes cartridge tape, 16 ports	End user, OEM, VAR
	3302/3400	Oct. 1987	NP	DP, GA, TP	MS/RT, Model 3000, 3100	4-6	NP	4-16	5	300M-3.1G	NP	WE, 321000	User Systems V	60	22	20	\$15,000 with 480 bytes memory, 1200 bytes disk, 1200 bytes cartridge tape, power supply	End user, OEM, VAR
	3300/3400 Model 370, 371	NP	NP	DP, GA	NP	4	100	2-64	NP	425-4900	33	80386	MS/DOS, OS/2, Unix, VMS, Xenix	302	8-32	20	\$15,000 with 480 bytes memory, 1200 bytes disk, 1200 bytes cartridge tape, power supply	End user, OEM, VAR
	3300/3400 Model 372	NP	NP	DP, GA	NP	7.7	100	4-64	NP	512M-5.6G	124	80386	User Systems V	481	22	20	\$17,400 with 480 bytes memory, 1200 bytes disk, 1200 bytes cartridge tape	End user, OEM, VAR
	3300/3400 Model 374	NP	NP	DP, GA	NP	7.7	200	4-64	NP	800M-8.9G	114	80386	MS-DOS, OS/2, Unix, VMS, Xenix	42	18-36	32	\$12,000-40,000 bytes memory, 1200 bytes disk, 1200 bytes cartridge tape	End user, OEM, VAR
	3300/3400 Model 375, 376	NP	NP	DP, GA, TP	NP	6.8	200	4-64	NP	800M-8.9G	68	80386	MS-DOS, OS/2, Unix, VMS, Xenix	32	18-36	32	\$14,000 with 480 bytes memory, 1200 bytes disk, 1200 bytes cartridge tape	End user, OEM, VAR
	3300/3400 Model 377, 378	NP	NP	DP, GA	NP	8	200	1-64	NP	560-420	25	80386	MS-DOS, OS/2, Unix, VMS, Xenix	26	8-16	32	\$11,500 with 480 bytes memory, 1200 bytes disk, 1200 bytes cartridge tape, power supply	End user, OEM, VAR
Bell N. T. Information Systems, Inc.	3312/3400 Model 370	NP	NP	DP, GA, TP	NP	NP	NP	NP	NP	NP	NP	Proprietary	28758	NP	4	\$14,000 with 256 bytes memory, 1200 bytes disk, 1200 bytes cartridge tape, power supply	End user, OEM, VAR	

*One DEC MIPS equals the performance of the DEC VAX-11/780.

DP = desktop processor; GA = general-purpose; TP = scientific/engineering; TP = on-line transaction processing; OA = office workstation.

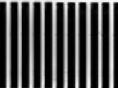
The companies included in this chart responded to a recent telephone survey conducted by *Computerworld*. When a vendor is unable to provide specific information about its product, the abbreviation NP (not provided) is used. When a question does not apply to a vendor's product, the abbreviation NA (not applicable) is used. Further product information is available from the vendors.

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A. Which products interest you?

- End user
- Consultant
- Reseller
- Corporate purchaser
- OEM
- Other
- 386 systems
- 286 systems
- Peripherals
- Other

B. Are you an:

- End user
- Consultant
- Reseller
- Corporate purchaser
- OEM
- Other

C. How many business PCs do you now have installed?

1-10

11-25

Over 25

D. How many PCs does your company plan to purchase in the next 12 months?

1-10

11-25

Over 25

E. Who is your primary computer source?

Corporate/Institutional
Small Business
Student/Educational
Home

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COMPANY _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

MAIN SWITCHBOARD NUMBER _____

DIRECT NUMBER _____

A. Which products interest you?

- End user
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11-25

Over 25

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Small Business
Student/Educational
Home



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PCs, WORKSTATIONS AND SMALL SYSTEMS

HARDWARE ROUNDUP

VENDOR	PRODUCT	PRIMARY MARKET	HOST COMPUTER/SYS OR S/DS SYSTEM	PERFORMANCE (MIPS)	HARDWARE CURRENTLY INSTALLED	DATA TRANSFER RATE	DISK CAPACITY (Megabytes)	NUMBER OF PORTS	PROCESSOR TYPE	OPERATING SYSTEM	MAXIMUM NUMBER OF USERS	STANDARD NUMBER OF USERS	WORKSTATION (MIPS)	PRICE	DISTRIBUTION					
Bell N. T. Information Systems, Inc. (401) 771-8000	DPX-4 Plus Model P210 April 1987	HP	DP, QL, TT	None	6.5-1	NP	4-18	1.0-1.8	Proprietary	SYMS	12	6-18	32	\$4,200 with 800-Kbyte memory; 8 ports, 800-Kbyte disk.	East Coast, OEM, West					
	DPX-4 Plus Model P220 April 1988	HP	DP, QL, TT	None	1	NP	9-19	1.3-1.8	68-1,200	OS/2	40	13-39	32	\$4,200 with 800-Kbyte memory; 8 ports, 800-Kbyte disk.	East Coast, OEM, West					
	DPX-100 Model D-100 June 1988	HP	DP, QL	HP	2.1-4.7	16-47	0-10	157-897	30	60000	30	20	\$4,200 with 128-Kbyte memory; 4 ports, 128-Kbyte disk.	East Coast, OEM, West						
	DPX-140 Model D-140 25	HP	DP, QL	HP	2.1-4.7, 4.1	16-47, 32	4-16	5-10	157-897	40	60000	30	20	\$21,400 with 128-Kbyte memory; 4 ports, 128-Kbyte disk.	East Coast, OEM, West					
	DPX-190 Model D-190 45	HP	DP, QL	HP	2.1-4.7, 4.1	16-47, 32	4-16	5-10	157-897	40	60000	30	20	\$21,400 with 128-Kbyte memory; 4 ports, 128-Kbyte disk; with 128-Kbyte memory; 4 ports, 128-Kbyte disk.	East Coast, OEM, West					
Comshare Computer Corp. (401) 758-7300	5000 and 5000 series	1982	6,000	SE, TP	HP	3-35	30	8-120	3	1000	4-80	CISC	Line Terminal, V.42bis 4.0	64	1-5	32	\$31,750 with 80-Kbyte memory; 14-24 ports, 80-Kbyte disk; with 80-Kbyte memory; 14-24 ports, 80-Kbyte disk.	East Coast, OEM, West		
	3212	1988	3,000	DP, SE, TT	VAX 8200	0.38	280	4-18	3	HP	6	CISC	QMS/2, Series	64	22	32	\$43,000 with 80-Kbyte memory.	East Coast, OEM, West		
	3205	1984	500	DP, SE, TT	Microware 2	0.387	400	2-8	1.2	HP	1	CISC	QMS/2, Series	34	16	32	\$21,300 with 80-Kbyte memory.	East Coast, OEM, West		
Control Data Corp. (813) 650-8182	Other 850-11 1987	March 1988	9,000	DP, SE, TT	VAX 8000	8.0	50	8-120	1-3.2	HP	NP	CISC	MCW/VME	NP	35	64	\$66,000 with 240-Kbyte memory; 80-Kbyte disk; with 240-Kbyte memory; 80-Kbyte disk.	East Coast, OEM, West		
Data General Corp. (800) 330-2346	Kelvin MT177000 XP	1987	HP	AE	Alpha 4800, 3200, 2400, 1600, 800	1,277	220	3-14	2-61-6	HP	120	NP	ADOS/VS, ADOS/RT/32, DG/6/1	90	20-60	32	\$21,000 with 240-Kbyte memory; 160-Kbyte power supply.	East Coast, OEM, West		
	Kelvin MT154000 Model 3000	1988	HP	AE	Microware 3000	3,007	80	14-64	2-67-5	HP	513	CISC	ADOS/VS, ADOS/RT/32, DG/6/1	513	60	32	\$66,000 with 240-Kbyte memory.	East Coast, OEM, West		
	Kelvin MVY 10000C series	April 1988	HP	QD	Alpha 4800, 3200, 2400, 1600, 800	1	140	4-12	1.5	40-327	11-97	CISC	ADOS/VS, ADOS/RT/32, DG/6/1	18	6	32	\$11,000 with 240-Kbyte memory; 160-Kbyte power supply; 128-Kbyte memory; 128-Kbyte disk.	East Coast, OEM, West		
	Excalibur MVY 20000C series	July 1988	HP	QD	Alpha 4800, 3200, 2400, 1600, 800	1.7	50	8-24	1.5	222	3-67	CISC	ADOS/VS, ADOS/RT/32, DG/6/1, DG/6/2, DG/6/3	64	24	32	\$23,000 with 240-Kbyte memory; 160-Kbyte power supply; 128-Kbyte memory; 128-Kbyte disk; with 128-Kbyte memory; 128-Kbyte disk.	East Coast, OEM, West		
	DC/2000	May 1988	HP	QD	PC LAN 8000	0.3	380	0-2-2	5400E	20-160	11-16	CISC	DG/6/005	10	1	14	\$4,900 with 128-Kbyte memory; 128-Kbyte disk; 2000-Eye floppy disk drive; 128-Kbyte tape drive.	East Coast, OEM, West		
Digital Equipment Corp. (800) 343-6660	Decimator 2120	June 1988	10,000	HP	SE	NA	14-34	30	0-24	1.3-4	3G	6	RISC	Chips	94	16	32	\$4,900 with 128-Kbyte memory; 128-Kbyte disk; 2000-Eye floppy disk drive; 128-Kbyte tape drive.	East Coast, OEM, West	
	Decimator 4000	July 1988	10,000	HP	SE	NA	16.0 Image	96	18-64	4	24-56	9.7G	120	RISC	Ubiq	107	NP	=	\$4,900 with 128-Kbyte memory; 128-Kbyte disk; 2000-Eye floppy disk drive; 128-Kbyte tape drive.	East Coast, OEM, West
	Microvax 2300	July 1988	10,000	HP	AE	Alpha 4800	2.4 VLSI [®]	120	0-22	4	1.95	13	CISC	Ubiq-32, VAL32/32, VMS	44	24	32	\$4,900 with 128-Kbyte memory; 128-Kbyte disk; 2000-Eye floppy disk drive; 128-Kbyte tape drive.	East Coast, OEM, West	
	Microvax 2300, 2400	Oct. 1988	10,000	HP	AE	Alpha 4800	2.4 VLSI [®]	120	0-22	4	-	7.3G	120	CISC	Ubiq-32, VAL32/32, VMS	44	24	32	\$4,900 with 128-Kbyte memory; 128-Kbyte disk; 2000-Eye floppy disk drive; 128-Kbyte tape drive.	East Coast, OEM, West
	Microvax 2400/2500	April 1989	10,000	HP	AE	Alpha 4800	3.0 VLSI [®]	60	16-64	8	9.7G	NP	CISC	Ubiq-32, VAL32/32, VMS	102	76	32	\$71,000 with 128-Kbyte memory; 128-Kbyte disk; 2000-Eye floppy disk drive; 128-Kbyte tape drive.	East Coast, OEM, West	
	Microvax- 1100	NP	NP	SE, TP	PC-1100	0.28 VLSI [®]	20F	0.533-4	2.4	622	1-30	CISC	DSMA-11, DSMA-11A, DSMA-11B, DSMA-11C, DSMA-11D, DSMA-11E	NP	20	10	\$11,000 with 128-Kbyte memory; 128-Kbyte disk; 2000-Eye floppy disk drive.	East Coast, OEM, West		
	Microvax- 1100	1988	NP	SE	PC-1100	0.28	20F	0-2	2.4	622	1-40	CISC	DSMA-11, DSMA-11A, DSMA-11B, DSMA-11C, DSMA-11D, DSMA-11E	NP	32	14	\$16,000 with 128-Kbyte memory.	East Coast, OEM, West		
	Microvax- 1100/1110	NP	NP	SE, TP	PC-1100	0.28 VLSI [®]	20F	0.533-4	2.4	622	1-40	CISC	DSMA-11, DSMA-11A, DSMA-11B, DSMA-11C, DSMA-11D, DSMA-11E	NP	32	14	\$16,000 with 128-Kbyte memory; 128-Kbyte disk; 2000-Eye floppy disk drive.	East Coast, OEM, West		
	Microvax- 1110/1120	NP	NP	SE, TP	PC-1100	0.31 VLSI [®]	20F	1-4	2.4	622	1-40	CISC	DSMA-11, DSMA-11A, DSMA-11B, DSMA-11C, DSMA-11D, DSMA-11E	NP	32	14	\$16,000 with 128-Kbyte memory; 128-Kbyte disk; 2000-Eye floppy disk drive.	East Coast, OEM, West		

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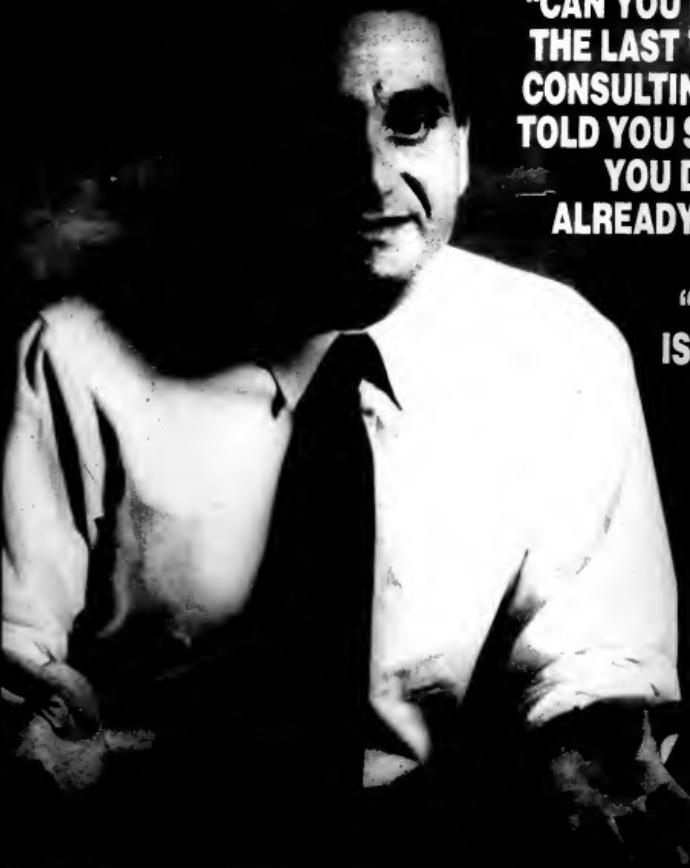
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VENDOR	PRODUCT	DATE FIRST INSTALLED AT CUSTOMER SITE	NUMBER CURRENTLY INSTALLED	PRIMARY MARKET	HOST COMMUNICATIONS OR DATA SYSTEM	PERFORMANCE (MIPS)	MACHINE CYCLE TIME (nanosec)	MEMORY BANKING (megabytes)	DISK TRANSFER RATE (megabytes/sec.)	DISK CAPACITY (megabytes)	NUMBER OF PORTS	PROCESSOR TYPE	OPERATING SYSTEMS	MAXIMUM NUMBER OF USERS	TYPICAL NUMBER OF USERS	WORD LENGTH (bits)	PRICE	DISTRIBUTION
Kaiser Computer Corp. (408) 447-3800	Concept Machine	Dec. 1985	3	SS	N/A	3-04	100	4-000	2.4	N/A	N/A	Proprietary	MIPS-32	N/A	N/A	32	\$62,000 with CPC; \$40K basic computer; 8 ports, 2 disk drives, 16 Mbytes	Bad ware, CIBW
Information	Prod. Model 1000	Mar. 1986	50	SS	VM/C	3.3-36.1	100	5-144	3	N/A	N/A	CISC	MIPS-32	2048	120	32	\$16,000 with CPC; \$10K basic computer, 3 ports, 1 disk drive, 16 Mbytes	Bad ware, CIBW
Computer Design Systems	Series 1000	Feb. 1986	50	SS	N/A	3.00	100	5-12	3	N/A	N/A	CISC	MIPS-32	256	48-44	32	\$71,000 with CPC; \$10K basic computer, 3 ports, 2 disk drives	Bad ware, CIBW
Midwest 2100	Model 2100	1986	100+	DP, SS, TP	N/A	4-00	20	16-40	1.8-16	N/A	240	DEC 32000 VAX	DEC System VAX	500	120-200	32	\$85,000 with CPC; \$40K basic computer, 240 ports, 16 Mbytes, 2 disk drives	Bad ware, CIBW
Server Computer Systems Inc. (408) 443-7747	High Stack Model 1200, 1200 rack units	Mar. 1986	10*	SS	N/A	3-14	40	60	3	100C	32-90	CISC	CRAY- C6400- C4100	256	32	32	\$31,000 with 480 bytes RAM, 1 CPC, 8 ports	Bad ware, CIBW
SI-40	Model 2100	June 1986	10*	SS	N/A	0.80	200	1.8-12	2.4	N/A	40	Proprietary	VG-16, VG-16E, VG-16E	48	16*	32-48	\$44,000	Bad ware, CIBW
U-700	Model 2100	April 1986	50*	SS	N/A	0.80	200	7.0-12	3.4	N/A	120	Proprietary	VG-16, VG-16E	128	32-48	32-48	\$50,000	Bad ware, CIBW
Burroughs-Pelard Co. (800) 783-0900	HP 2640 Station 1000	April 1986	10*	DP, TP	ADAMOS, TURBO TADS	3	60	32-64	N/A	256	N/A	MIPS-32	128	N/A	N/A	32	\$100,000 with 2560 bytes memory	Bad ware, CIBW
	HP 2650 Station 1000	April 1986	10*	DP, TP	ADAMOS, TURBO TADS	10*	60	34-68	N/A	42	N/A	MIPS-32	60	N/A	-	-	\$100,000 with 2560 bytes memory	Bad ware, CIBW
	Micro 3000/4000	April 1986	TP	ADAMOS, TURBO TADS	N/A	110	8-4	1.25	1200- 32C	3-16	CISC	MIPS-V	32	13-14	16	\$11,000 with 256 bytes memory, 1280 bytes disk, 8 ports, multifunction boards, 4 ports	Bad ware, CIBW	

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MSGID(IJK578) : REDUCE BROADCAST LATENCY FOR THE NUMBER
                  10 EVERY 5 MINUTES
      (INIT SECTION)
      pretime = TIME(MIN) 5
      (PROC SECTION)
      IF(TIME(MIN) >= pretime) THEN
          msg_user = TIME(MIN);
          msg_user = DISPLAY("Done");
          RETURN DISPLAY;
      END
      Here when an IJK578 displayed in the last
      msg_user
      RETURN SUPPRESS;
  
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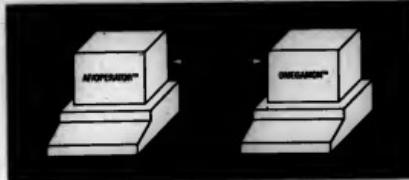
MSGID(IJK578) : SUPPRESS
 MSGID(IJK578) : EVERY 5 MINUTES : DISPLAY

PCs, WORKSTATIONS AND SMALL SYSTEMS
HARDWARE ROUNDUP

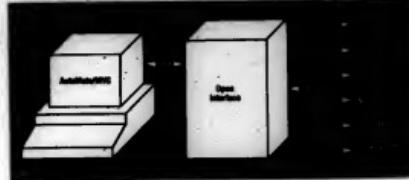
VENOR	PRODUCT	DATA BASE INSTALLED AT CLASSIFICATION SITE	NUMBER CURRENTLY INSTALLED	PRIMARY MARKET	MOST COMPATIBLE RAM OR DISK SYSTEM	PERFORMANCE (MIPS)	MACHINE CYCLE TIME (NSEC)	MEMORY RANGE (megabytes)	DISK TRANSFER RATE (megabytes/sec)	DISK CAPACITY (megabytes)	NUMBER OF PORTS	PROCESSOR TYPE	OPERATING SYSTEMS	MAXIMUM NUMBER OF USERS	TYPICAL NUMBER OF USERS	WORD LENGTH (BITS)	PRICE	DESCRIPTION			
Bentley-Podium Co. 6000 710-0000	Micro 3000	Aug. 1985	NP	TP	IBM PC, compat., Apple, Macintosh, Sun, VME	NP	12.5	2-4	1.25	80-300	5-6	CISC	MPS-V	8	5-7	16	\$16,000 with 256-byte cache, 128-Mbyte disk, cartridge tape	End user, OEM, VAR			
	Micro 3000X	May, 1986	NP	TP	IBM PC, compat., Apple, Macintosh, Sun, VME	NP	12.7	3-8	NP	6.8G	9-16	CISC	MPS-V	16	17-23	16	\$24,000 with 256-byte cache	End user, OEM, VAR			
	MP 2000	Sept. 1987	NP	TP	IBM PC, compat., Apple, Macintosh, Sun, VME	NP	9.7	9-12	NP	6.1G	72	DEC	RP/32	12	20-40	32	\$25,000 with 256-byte cache	End user, OEM, VAR			
	MP 4000	Sept. 1988	NP	TP	IBM PC, compat., Apple, Macintosh, Sun, VME	NP	9.8	9-16	NP	6.8G	56	DEC	RP/32	60	18-34	32	\$14,000 with 256-byte cache	End user, OEM, VAR			
	MP 4000 Model 810	Sept. 1988	NP	TP	IBM PC, compat., Apple, Macintosh, Sun, VME	NP	9.8	9-16	NP	6.8G	56	DEC	RP/32	60	18-34	32	\$14,000 with 256-byte cache	End user, OEM, VAR			
	MP 4000 Model 820	Aug. 1989	NP	TP, CR, T2, TA	NP	NP	12.0	6-18	1.25	630-942	NP	NP	NP	NP	22	NP	16	\$14,000 with 256-byte cache, 4096-byte disk, cartridge tape	End user, OEM, VAR		
IBM 10000 385-4430	AS/400 Model 10	Aug. 1988	NP	TP, CR, T2, TA	NP	NP	12.0	6-18	1.25	630-942	NP	NP	NP	NP	22	NP	16	\$14,000 with 256-byte cache, 4096-byte disk, cartridge tape	End user, OEM, VAR		
	AS/400 Model 20	Aug. 1988	NP	TP, CR, T2, TA	NP	NP	12.0	6-28	1.2	630-2200	16-72	VLSI	VMS/V	NP	NP	22	NP	16	\$14,000 with 256-byte cache, 4096-byte disk, cartridge tape	End user, OEM, VAR	
	AS/400 Model 30	Aug. 1988	NP	TP, CR, T2, TA	NP	NP	9.4	6-40	NP	9.8G	34-72	VLSI	VMS/V	NP	NP	22	NP	16	\$14,000 with 256-byte cache, 4096-byte disk, cartridge tape	End user, OEM, VAR	
	AS/400 Model 40	Aug. 1988	NP	TP, CR, T2, TA	NP	NP	9.4	6-40	NP	9.8G	34-72	VLSI	VMS/V	NP	NP	22	NP	16	\$14,000 with 256-byte cache, 4096-byte disk, cartridge tape	End user, OEM, VAR	
	AS/400 Model 500	Nov. 1987	NP	TP, CR, T2, TA	NP	NP	100	3-2	1.25	65-470	4	LSI	SEP	NP	NP	6	NP	6	\$12,000 with 8-Mbyte cache, 4096-byte disk, 256-Mbyte tape, 256-Mbyte memory	End user, OEM, VAR	
	AS/400 Model 520	Nov. 1987	NP	TP	NP	NP	100	4-16	NP	NP	NP	CISC	VMS/V, VM/CP, VM/OS, AIX/RT, AIX/OS, MVS/TP, VM/RT	NP	NP	22	NP	16	\$12,000 with 8-Mbyte cache, 4096-byte disk, 256-Mbyte tape, 256-Mbyte memory	End user, OEM, VAR	
Dynamis Inc. 2000 385-4430	DS/32	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	32	NP	NP	\$16,000 with CPU, minimum memory	End user, OEM, VAR	
	DS/32-20	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	32	NP	NP	\$16,000 with CPU, minimum memory	End user, OEM, VAR	
	DS/32-30	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	32	NP	NP	\$16,000 with CPU, minimum memory	End user, OEM, VAR	
	DS/32-40	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	32	NP	NP	\$16,000 with CPU, minimum memory	End user, OEM, VAR	
	DS/32-50	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	32	NP	NP	\$16,000 with CPU, minimum memory	End user, OEM, VAR	
	DS/32-60	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	32	NP	NP	\$16,000 with CPU, minimum memory	End user, OEM, VAR	
ICL North America, Software Division 771-61-4400-7432	PowerServer 200-Series	May 1988	100	CR, CR	Power	4	NP	4-28	NP	90-700	6-64	CISC	Univ. System	NP	NP	8-29	32	\$4,500-\$86,700 with 4-Mbyte RAM, 8-Mbyte disk, 256-Mbyte tape, 256-Mbyte memory	End user, OEM, VAR		
	Power 400	1988	1,000	CR	NP	3-15	NP	8-120	NP	32-384	NP	Uni	Power	160	160	32	NP	160	\$50,000	End user, OEM, VAR	
	Advanced Series 20, 40, 60	May 1988	NP	NP	AS/400, DEC, VME, 64000	NP	NP	1-48	2-4	NP	132-255	CISC	RS/6000/32	180	30	NP	NP	30	\$20,000 with CPU, 64-Mbyte RAM, 32-Mbyte disk, 32 parts, 128-Mbyte memory	End user, OEM, VAR	
	RS/6000	1988	NP	NP	CR, CR	NP	NP	NP	NP	34-230	9	RS/6000	RS/6000	6	6	NP	NP	6	\$3,000 with 64-Mbyte RAM, 256-Mbyte disk, 2 parts	Dealer, VAR	
	RS/6000	1987	NP	NP	NP	NP	NP	NP	NP	40-230	17	RS/6000	RS/6000/2	17	18	NP	NP	18	\$4,500 with 1.5-Mbyte RAM, 32-Mbyte disk, 2 parts	Dealer, VAR	
	RS/6000	1986	NP	NP	NP	NP	NP	NP	NP	73-245	14	RS/6000	RS/6000	14	6-8	NP	NP	8	\$11,000 with 256-Mbyte RAM, 256-Mbyte disk, 2 parts	Dealer, VAR	
National Computer Systems Inc. 771-61-4400-0300	Series 20	1987	200	NP	TP	NP	NP	4-22	NP	NP	NP	NP	TPC/200	RS/6000	NP	NP	32	NP	32	\$11,000 with 256-Mbyte RAM, 256-Mbyte disk, 2 parts	End user, OEM, VAR
	Series 4000	1988	NP	NP	NP	NP	NP	4-16	NP	NP	NP	NP	TPC/4000	RS/6000	74	40	NP	NP	32	\$11,000 with 256-Mbyte RAM, 256-Mbyte disk, 2 parts	End user, OEM, VAR
National Computer Systems Inc. 771-61-4400-0300	Series 50	1987	200	NP	TP	NP	NP	4-22	NP	NP	NP	NP	TPC/5000	RS/6000	NP	NP	32	NP	32	\$11,000 with 256-Mbyte RAM, 256-Mbyte disk, 2 parts	End user, OEM, VAR
	Series 6000	1988	NP	NP	NP	NP	NP	4-16	NP	NP	NP	NP	TPC/6000	RS/6000	NP	NP	32	NP	32	\$11,000 with 256-Mbyte RAM, 256-Mbyte disk, 2 parts	End user, OEM, VAR

VENDOR	PRODUCT	NUMBER INSTALLED AT CUSTOMER SITE	HIGHLY COMPATIBLE WITH OR DIS SYSTEM	PRIMARY MARKET	PERFORMANCE (MHz)	MACHINE CYCLE TIME (nanos)	MEMORY RANGE (megabytes)	DISK CAPACITY (megabytes)	NUMBER OF PORTS	PROCESSOR TYPE	OPERATING SYSTEMS	MAXIMUM NUMBER OF USERS	TYPICAL NUMBER OF USERS	WORK LENGTH (in.)	PRICE	DISTRIBUTION
Micro Computer Systems, Inc. (408) 730-1700	M100*	1,000	DP, SP	Small business	4.0	60	8-48	1	640	Up to 30	DEC	Units	HP	HP	\$3,000-\$7,000 with 100M disk memory, 40M tape disk, 22 Mbytes memory, 10M disk, 10M tape, 10 ports	
Micro Computer Group (408) 255-0900	Delta Series 2000 Model 2300*	1,000+	HP	GA	A2400	4.7	NP	4-19	125	NP	16	CISC	Units	4	\$17,495 with 30-Mbyte disk, 10-Mbyte tape, 10 ports	
	Delta Series 2000 Model 2300, 3000	1988	HP	GA	A3600	3.8, 4.7	NP	4-14	22	NP	30, 48	CISC	Units	33, 38	\$17,495 with 30-Mbyte disk, 10-Mbyte tape, 10 ports	
	Delta Series 2400 Model 2400, 3400	Sept. 1988	HP	GA	A3600	5.3	NP	8-32	22	NP	64	CISC	Units	64	\$27,495 with 30-Mbyte disk, 10-Mbyte tape, 10 ports	
	Delta Series 3400 Model 3400	Oct. 1988	HP	GA	A3600	5.9	NP	8-40	12	NP	60	CISC	Units	60	\$36,495 with 30-Mbyte disk, 10-Mbyte tape, 10 ports	
NEC Corp. (408) 648-0000	NEC Tower Model	April 1988	HP, SP, GA	MINSTL	HP	60	2-6	NP	53-870	6-11	CISC	Units	13	7	\$6,000-\$10,000 with 100M disk, 10M tape, 4 ports	
	NEC Tower Model	Dec. 1988	HP	SP, TP	NECML	2	545	8-32	1,0	NECML	10	CISC	Units	10	\$10,000-\$12,000 with 100M disk, 10M tape, 10 ports	

THEIR INTERFACE.



OUR INTERFACE.



VENUE	PRODUCT	DATE FIRST INSTALLED	NUMBER CUSTOMERS INSTALLED	PRIMARY MARKET	MOST COMPARABLE MAC OR DEC SYSTEM	PERFORMANCE (MIPS)	MACHINE CYCLE TIME (Nanosec)	MEMORY RANGE (Megabytes)	DISK TRANSFER RATE	DISK CAPACITY (Megabytes)	NUMBER OF PORTS	PROCESSOR TYPE	OPERATING SYSTEMS	MAXIMUM NUMBER OF USERS	TYPICAL NUMBER OF USERS	WORD LENGTH (bits)	PRICE	DESCRIPTION
DEC Corp. (510) 645-0000		Date	Rev.	HP, TP	HP	HP	250	0-16	8	HP	48	DEC	Unis	32	16	32	\$44,000 with 80-MHz processor, 16-MB main mem., 16-MB disk, 16-MB video, 16-MB memory bus.	Mid-size
DEC Information Systems Inc. (510) 645-0000	Dimension 3000	April 1985	900	HP, TP	DEC	8-7	90	2-16	0.98	650	4-16	DEC20	RTX, Xenix, MS-DOS	16	8-16	22	\$14,000 with 16-MHz processor, 16-MB main mem., 16-MB disk, 16-MB video, 16-MB memory bus.	Desktop, VME
	Alpha 32/100	March 1986	HP	HP, CR	Microvax	4	107	2-10	1.25	580	16	Multiple	NIC ASTB- II	16	8-16	22	\$14,000 with 32-MHz processor, 16-MB main mem., 16-MB disk, 16-MB video, 16-MB memory bus.	VME
Standard Computer Corp. (617) 889-3000	Series 2000	1985	HP	HP, CR	DEC RT/1000	8	60	2.24-3	1.25	177	16	multiple	NIC ASTB- II	16	32-64	32	\$13,990 with 14-MHz processor, 16-MB main mem., 16-MB disk, 16-MB video, 16-MB memory bus.	Mid-size
	Series 2000	1986	HP	HP, CR	DEC RT/1000	8	60	2.24-3	1.25	177	16	multiple	NIC ASTB- II	16	32-64	32	\$13,990 with 14-MHz processor, 16-MB main mem., 16-MB disk, 16-MB video, 16-MB memory bus.	Mid-size
Prime Computer, Inc. (508) 869-3000	Argus	July 1987	HP	AB	ADAMOS, Memory 32MB	1.6	120	4-12	2.4	177	40-256	CISC	Primes	100	30-36	22	\$16,000-\$18,000 with 432-MHz processor, 32-MB main mem., 32-MB disk, 32-MB video, 32-MB memory bus.	Mid-size, VME
	Argus	June 1988	HP	AB	ADAMOS, Memory 32MB	2.6	82	8-32	1.5	64-256	CISC	Primes	100	30-48	32	\$44,000 with 432-MHz processor, 32-MB main mem., 32-MB disk, 32-MB video, 32-MB memory bus, CPU.	Mid-size, VME	

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VENDEUR	PRODUCT	NUMBER INSTALLED AT COMPUTER SITE	NUMBER CURRENTLY INSTALLED	MAINTAINABLE MAN OR IN SYSTEM	PERFORMANCE (MIPS)	MACHINE CYCLE TIME (NANOSEC)	MEMORY RAM (Kbytes)	DISK DRIVES (Kbytes/Sec.)	DISK CAPACITY (Megabytes)	NUMBER OF PORTS	PROGRAM TYPE	OPERATING SYSTEMS	MAXIMUM NUMBER OF USERS	TYPICAL NUMBER OF USERS	WORD LENGTH (BITS)	PRICE	DESCRIPTION
Pitney Bowes Computer, Inc. (212) 688-0000	8800	App. 2,000	TP	AS/400, AS/400e, AS/400i, AS/400iX, AS/400iXe, AS/400iXe	2.0	77	8-32	1.0	NP	64-256	CISC	Primes	1000	20-40	32	AS/400 with 32-bit Alpha processor, 32-bit Alpha memory, 100-MHz CPU	
	4800	Prod. 1988	TP	AS/400, AS/400e, AS/400i, AS/400iX, AS/400iXe	2.0	60	18-20	2.4	NP	128-512	CISC	Primes	500	20	32	AS/400 with 32-bit Alpha processor, 32-bit Alpha memory, 100-MHz CPU	
Prime 3200	Model 1988	NP	DP, GA	PRD	3.0	NP	9-16	NP	Up to 417	34	68000	Primes	10	10	32	3200 with 32-bit Alpha processor, 32-bit Alpha memory, 100-MHz CPU	
Separate Computer Systems, Inc. (510) 456-5700	4200	App. 1987	TP	DEC 3300	0.40	625	8-32	1.5	NP	100	CISC	DYNAES	200	20-100	32	844-000 with 32-bit Alpha processor, 32-bit Alpha memory, 100-MHz CPU	
Separate Computer Systems, Inc. (510) 456-5700	4200	App. 1987	TP	DEC 3300	0.40	625	8-32	1.5	NP	100	CISC	DYNAES	200	20-100	32	844-000 with 32-bit Alpha processor, 32-bit Alpha memory, 100-MHz CPU	
Thomson Computer Systems, Inc. (212) 628-2800	Orion CLX	Qtr. 1987	TP	IBM Sys. 32	NP	62.5	9-14	Up to 2.40	NP	59-113	CISC	VMS	NP	NP	32	871-000	
Tandon Computer, Inc. (404) 725-4000	Fourth Generation CLX	TP	TP	IBM 3270A, IBM 3270B, IBM 3270C	1-6	125	9-12	1.2	10,000	3-812	CISC	Guardian 90	3-412	50-300	32	861-000 with CISC processor, 32-bit Alpha memory, 100-MHz CPU, hard disk drives, 32-bit Alpha memory, power supply	
	Tandon 3270	Jan. 1987	TP	VAL 1110, VAL 1110/700, VAL 1110/800, VAL 1110/900	NP	NP	9-16	1.0	NP	NP	88000	Giga Systems V	20	10-24	32	823-740 with 32-bit Alpha processor, 32-bit Alpha memory, 100-MHz CPU, hard disk drive, 32-bit Alpha memory, power supply	
Toshiba Instruments, Inc. (201) 527-3000	1000 Series System Series 1000 Model 1000E	App. 1988	NP	DP	NP	NP	NP	NP	NP	2	88000	T1 System V	10	4	32	\$1,495 with 32-bit Alpha memory, 134-MHz Z800	

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HARDWARE ROUNDUP

VENDOR	PRODUCT	DATE FIRST INSTALLED AT CUSTOMER SITE		NAME OF COMPANY INSTALLED	PRIMARY MARKET	MOST COMPARABLE MAC OR PC SYSTEM	PERFORMANCE (MIPS)	MACHINE CYCLE TIME (nsec)	MEMORY RANGE (megabytes)	DATA TRANSFER RATE (megabytes/sec.)	DISK CAPACITY (megabytes)	NUMBER OF PORTS	PROCESSOR TYPE	OPERATING SYSTEMS	MAXIMUM NUMBER OF USERS	TYPICAL NUMBER OF USERS	WORD LENGTH (bits)	PRICE	INFORMATION
		DATE	YEAR																
Sony Instruments, Inc. (800) 857-3880	1000 Series 1000 Model 1200 Model 1300MT	April	1986	NP	DP	IBM PS/2	NP	NP	2-16	0.88	NP	6	80386	T1 Systems V	24	8-24	32	\$8,000 with 256- byte RAM, 80486- byte processor, 40MB-hard disk, 1.2MB-lyte floppy	VAR
	1000 Series 1000 Model 1200 Model 1300	Nov.	1987	NP	DP	IBM PS/2	4	50	4-16	10	NP	6	80386	T1 Systems V	32	16-32	32	\$8,000 with 4MB- byte memory, 162MB-hard disk, 1.2MB-lyte floppy	VAR
	1000 Series 1000 Model 1200 1300	Oct.	1988	NP	DP	DEC VAX 3100 3200 3300	2.5-10	480	2-60	1.81	NP	8	68030	T1 Systems V	Up to 256	NP	32	\$4,400 with 16MB- byte memory, 300MB-hard disk, 40MB-lyte tape	VAR
	1000 Series 1000 Model 1200	1989	NP	DP	TP	DEC VAX 3100 3200 3300	2.5-10	480	2-60	1.81	NP	8	68030	T1 Systems V	16	8-16	32	\$4,400 with 16MB- byte memory, 300MB-hard disk, 40MB-lyte tape	VAR
Third Coast Technologies, Inc. (614) 472-4230	EL-386	1986	NP	DP, OA, TP	PS/2	4.6	42	1-16	7.5	250	2	CISC	MS-DOS, SCX, SCO, TOS/OS	16	8	32	\$4,250 with 16MB- byte RAM, 300- MB-hard disk	OS/2, disker, VAR	
	Tele-386	1988	NP	DP, OA, TP	PS/2	6	40	4-16	32	3.4G	16	CISC	MS-DOS, SCX, SCO, TOS/OS	64	16	32	\$11,250 with 4MB- byte RAM, 1.1GB- byte disk, 16 ports	OS/2, disker, VAR	
Unisys Corp. (312) 973-70000	HUGEN CP- 643	1987	61,280	OA	NP	3.5	62.5	1-4	1.5	2.2G	16	80386	CTOS	16	16	16	\$4,800 per user	End user, VAR	
	NGEN PRD-140	1988	61,280	OA	NP	5	40	4-24	1.5	140M- 2.2G	32	80386	CTOS	32	32	16	\$11,200 per user	End user, VAR	
	NGEN CP- 642, CP- 643, CP- 644	1989	61,280	OA	NP	1.1	125	1-4 (NP)	1.5	2.2G	12	80386	CTOS	12	12	16	\$2,800, \$3,000, \$3,000	End user, VAR	
	U5000/95	June 1988	NP	DP, OA, TP	Micro- VAX, VME, Systems 386 AS/4000	NP	25	4-16	2.5	17.9M- 4.8G	64	NP	Unisys System V	64	16-32	32	\$31,000 with CPU, 436-lyte memory, 175MB-hard disk, 150MB-lyte tape	NP	
	U5000/95 EP, DP	Jan. 1989	NP	DP, OA, TP	Micro- vax II, VME, Systems 386 AS/4000	NP	25	4-64	2.5	17.0M- 1.9G, 327M- 8.1G	60	NP	Unisys System V	60	16-64	32	\$38,000, \$44,000 with CPU, 436-lyte memory, 175MB- hard disk, 150MB- lyte tape	NP	
	U5000/95 EP, TP	Jan. 1989	NP	DP, OA, TP	Micro- vax II, VME, Systems 386 AS/4000	NP	25	8-64	2.5	327M- 8.1G, 327M- 2.3G	128	NP	Unisys System V	128	25-64	32	\$44,000 (1 CPU), \$63,000 (2 CPUs) with 80386- processor, 327M- lyte memory, 150MB- lyte tape	NP	
	DS8	March 1987	NP	DP, OA, TP	AS/4000 Systems 386 Micro- vax II, VME	NP	16	1-4	0.6	2.0M- 2.3G	NP	NP	BTOS, MS- DOS	64	12-64	16, 32	\$8,000 with 16M- byte memory, power supply, four ports	End user, VAR	
	Micro A (604) 8000	Jan. 1988	NP	DP, TP	AS/4000	NP	NP	13-12	1.2	1.4G	NP	CISC	MC/PAS, OS/2	NP	16	64	\$14,000 with 128- byte memory, 200MB- hard disk, 1.2MB- lyte tape	NP	
Wang Laboratories, Inc. (609) 439-5000	V5 5000 Series	July 1988	5,500	DP, OA	AS/4000	NP	160	1-16	1.25	10G	Up to 128	CISC	VSO/S, VS/VMM, BN/DX	128	4-128	32	\$2,000 with 16M- byte memory, CPU, 732-lyte disk, 1.2MB-lyte floppy, four ports, power supply	End user, VAR	
	V5 7000 Series	Jan. 1987	4,000	DP, OA, TP	AS/4000	NP	120	4-22	2	NP	Up to 928	CISC	VSO/S, BN/DX	Up to 1,012	16-300	32	\$29,000 with 128- byte memory, one serial I/O controller	End user, VAR	
West Systems (800) 224-6400	System 2256	Jan. 1988	250	TP	NP	4	NP	4-12	16	1.8G	Up to 52	68030	Proprietary	20	34	38	\$29,000 with 48- byte memory, four ports, power supply	End user	

IN DEPTH

Document imaging: The right fit?

Identifying high-payoff applications is key

BY WICK KEATING

While document imaging is just entering the mainstream, many information systems managers are not sure where this information processing technology fits into their organization. Experience has shown that it is more effective for some applications than others. So the key to successfully implementing document imaging is to identify uses with potentially high payoffs.

Document imaging replaces paper documents and files with digitized images of the original. Paper documents are converted to electronic form via scanners. The resulting pattern, known as a bit map, is an exact representation of the paper image.

Digitized images are stored on optical discs or other media and often are transmitted via data communications networks. Users control the scanning, storing, retrieving, reviewing and routing of document images through desktop workstations equipped with large, high-resolution displays and software for manipulating and displaying images.

Many current document imaging systems are stand-alone and relatively small — in the



DENNIS WETHERBY

teins of users. A few have limited integration with other information processing systems. Many installed systems serve as electronic replacements for file cabinets — documents are scanned, stored and retrieved on demand.

The first large-scale systems — hundreds of users and more — are now coming into use, thanks to new technology that has made them economically feasible to build. Vendors are starting to offer products with higher capacity, greater reliability, better performance and facilities for

integrating them with data processing systems.

Until recently, many document imaging systems were based on proprietary architectures.

Today, the clear trend is toward larger integrated systems based on standard architectures and components — that is, workstations and networks.

At first glance, it would seem simple to identify likely situations for document imaging: Just look for operations with lots of paper, large numbers of file cabinets, busy mailrooms and desks piled high with paper and folders.

While that is the right way to start, identifying good potential applications is more complicated. You may find, for example, that the paper in all those file cabinets is rarely referenced and that these cabinets (or microfilm) really are the most cost-effective answer. You may also find that paper can be eliminated by using another technology.

Furthermore, because document imaging systems range from single workstations to

Kesting is a vice-president at American Management Systems, Inc., an Arlington, Va., software and systems integration firm. He heads a group specializing in the planning and implementation of document imaging and other advanced information technologies.

- **Paper-choked areas are a good start**
- **Look to improve service, cash flow, cost**
- **Smart organizations rethink processes**

large systems with hundreds of users and millions of documents, the definition of "large" is vague. Even the simplest stand-alone system costs between \$30,000 and \$50,000 and large-scale systems can cost several million dollars, so paper volume may be quite high to justify the investment.

Imaging requires powerful PC workstations and expensive software to manage information flow. It also produces huge amounts of data that must be stored. For example, even after applying data compression techniques, a typical file by 11-in. paper still contains 50K bytes or more of storage. Storage costs can be a major factor in driving up system costs.

Even the goal of eliminating large amounts of paper may not be enough to justify an investment in document imaging. Consider a credit card application processing operation. The application consists of a single document from which a few key pieces of data are extracted (income, savings, outstanding debt). In this case, the most effective approach may be simply to keep keying the needed data into a traditional DP system and fit the application away.

In contrast, processing mortgage applications — where there are a number of documents coming in over a period of time, where each of the documents receives close scrutiny and where there is a market advantage to speedy approval — may be an ideal use of the technology.

Assuming that enough paper

can be eliminated, other signs indicate that an application may be well suited to document imaging. Needed information cannot be captured with a few keystrokes.

- Paper must be replaced frequently during processing.
- Documents must be retrieved by a number of individuals.
- Paper requires significant processing or handling.
- Documents contain information essential to the business or organizational mission.
- User organization is amenable to new technologies and procedures.
- The application is suited to the technology's capabilities.

Unfortunately, it is impossible to give precise or quantitative guidance on applying these factors. For one thing, the cost of document imaging systems is dropping, and the systems are getting more powerful. The result is that any guideline, such as that the minimum size needed to justify a system, quickly becomes outdated.

Moreover, purchases may be justified based on one of these factors or a combination. The payoff for one application may be in reducing the high volume of paper storage. For another, it may be in reducing search and retrieval activity. The payoff for a third application might come from streamlined processing, and yet another might benefit from better document tracking.

Document imaging is well suited to applications for which paper cannot be eliminated through other, less expensive forms of automation such as electronic mail and electronic data interchange (EDI). In general, imaging is a good choice in several cases: when paper comes in from outside the organization; where there is no option for EDI or other form of direct data capture and when information on paper cannot be "coded." Signatures, handwritten information or diagrams on paper are well suited to imaging.

Likewise, if a paper trail is needed for audit or regulatory reasons, imaging may be appropriate. In some cases, imaging can be a short-term strategy prior to implementing EDI. Hybrid solutions using EDI and imaging may also be effective.

Using such an approach, transactions with large suppliers could be automated using EDI, while smaller scale transactions would remain paper-

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Handling large numbers of paper documents and files is surprisingly expensive. Costs include the staff needed to file, retrieve, copy and transport paper, as well as the price of storage space and copying equipment.

In contrast, documents scanned into an imaging system can be filed, retrieved, reproduced and distributed with the push of a button. This eliminates labor costs associated with paper handling, as well as the need for large storage facilities.

Since scanned documents can be viewed by multiple users simultaneously, the need for copying is greatly reduced. Further, lost productivity due to critical documents being "out of file" is eliminated.

American Express Co. has reduced the number of document handlers and clerical staff needed to process credit card slips from 300 to six by introducing document imaging technology.

The United States Automobile Association expects its document imaging system to eliminate thousands of square feet of expensive storage space now used to house claims files.

A major cost of paper-intensive processes is the time spent by managers and professional staff on chores such as locating necessary pieces of paper or files. Document imaging can greatly reduce time needed for such activities.

Although difficult to measure accurately, time spent searching for files or documents prevents knowledge workers from applying their skills and experience to higher value activities, such as reviewing credit applications and claims, making underwriting decisions and responding to customer inquiries.

When transactions are paper-based, processing is limited by the speed the paper can move through the organization. For example, customers cannot receive bills until answered, until it has reached the proper individual, messages cannot be approved until all supporting documents have been received and reviewed, and insurance claims cannot be paid until all documentation has been reviewed by a claims adjuster.

Document imaging lifts this constraint. Once documents are received, they can be scanned and made available immediately to all interested parties. The result is faster, more responsive service, better cash flow — and a competitive edge.

The U.S. Department of Veterans Affairs, for example, uses a document imaging system to process claims for educational benefits under the GI Bill. In the paper environment, it often took several days to locate the file and respond to the inquiry.

Now, veterans' inquiries about the status of their claims are answered immediately over the phone. The department's imaging system has yielded a dramatic improvement in service to veterans and increased the morale of employees handling inquiries.

Get the paper out

One of the problems of paper processing is the lack of control. With scattered documents and files, it is often difficult to determine the backlog of work, the status of a given transaction or the location of a particular document or file. Paper processing also makes it harder to enforce policies and procedures and control errors.

Since electronic document processing can be managed with software, information systems departments can implement sophisticated reporting capabilities. This gives managers and supervisors the tools needed to effectively monitor operations.

Using software to control work assignments and processing flow, managers can ensure that work is assigned to the right people and handled in the proper order. For example, work-flow software can automatically assign claims to adjusters based on the type of claim and the adjuster's work load, assign cases to investigators based on the type of case or assign credit applications to loan officers based on the requested amount.

Such systems also give users all the information needed for processing — images of documents as well as data from other systems — and present it in the appropriate sequence.

Well-designed work-flow software can ensure that work gets handled in the optimum sequence (oldest to newest, highest to lowest) rather than in such less desirable, inefficient ways as this first file.

A key feature of document imaging is that it can use software to control the flow of information, that is, files, documents and data, through the organization.

This so-called work-flow software makes sure that the right information is presented to the right people at the right time. It also automates many routine, time-consuming tasks that staff members perform in a paper-based operation and provides a tool to effectively manage processes that consistently rely on paper-based information.

The software can also check to see if a file is complete (that is, all documents have been received); assign work to individuals (assign a loan officer to a loan or a credit application to a loan officer); direct the order of processing by individuals (work on the oldest first); the largest dollar items first); route files from one individual to another or one department to another; retrieve related information, such as data from a customer database; or track and report the status of documents and files.

Work-flow software can produce tremendous reductions in the time it takes to move information through an organization. It also can significantly increase staff productivity.

Designing the most effective work-flow application is not easy, however. Replacing paper with images and automating the current flows and processing is not the way to achieve the maximum return on an investment in document imaging.

Success requires a thorough understanding of the operation being automated; it also depends on the vision to reduce business processes to take advantage of the capabilities of the technology.

WICK KEATING

Telltale signs

Any of the following can indicate that image processing is a good fit:

- Large amount of paper produced
- Physical files
- Multiple documents in each file
- Extensive use of microfilm/microfiche

Data cannot be keyed

- Drawings
- Handwritten information
- Signatures

Frequent access and retrievals

- Same information is used by different people or organizations
- Frequent customer file inquiries
- Heavy reliance on files

Extensive processing required

- Multiple views and decisions
- Complex routing

Information is critical

- Errors are costly
- Direct relationship to customer service

User organization amenable

- Willing to do business in new ways
- Enthusiastic about benefits
- Understands effort required to implement a new system

WICK KEATING is a principal in the consulting firm of WICK KEATING Associates Inc., a division of WICK KEATING & CO. INC.

based and be processed with document imaging.

Many functions that have traditionally used paper as a medium to transmit information can be automated in ways that replace paper altogether. For example, with the proper software, EDI can automate common business transactions such as purchase orders and invoices between business entities.

The documents there are likely to be suppliers or customers who do not have EDI capability. Or you may need to follow EDI-initiated transactions with paper backup as a protection against disputes over erroneous electronic transactions.

Some firms are eliminating, or at least reducing, paper through E-mail or new systems that capture needed information

directly. For example, much of the paper associated with internal administrative matters can be eliminated with E-mail.

Storage qualities

Document imaging also shines in situations where documents must be located and retrieved frequently, quickly or at many points during processing. It is also appropriate when documents must be available to many people. Because this approach provides fast, reliable access to any number of users, processing is sped up, and the cost and delay resulting from locating, copying and distribution documents are eliminated.

The more complicated the processing — and the more hands the paper must pass through — the more document

processing can be useful. Conversely, a process in which paper comes to a single person who reviews it once and files it is not likely to be appropriate for imaging.

Some good candidates are processes in which a number of documents must be matched up before the transaction can be processed, where multiple individuals must review the file, where there is a preferred order for working on cases or where the files are assigned to individuals based on factors such as the type of case.

Areas likely to yield the highest return on investment from document imaging are likely to be those that are essential to the business. Examples include underwriting or claims in the insurance industry; case processing in pharmaceutical companies; credit application processing in banking; and order processing, billing and customer service in any industry.

Like any new technology, document imaging should be introduced in a receptive environment. Firms selected for the initial use of document imaging should have a staff and management that are open to doing business in new ways. They should also be willing to accept the inevitable minor problems that arise when new systems are implemented.



many potential users are unfamiliar with the technology. Because they lack experience to draw from, first-time users often find it difficult to visualize how a system will be used or help their business.

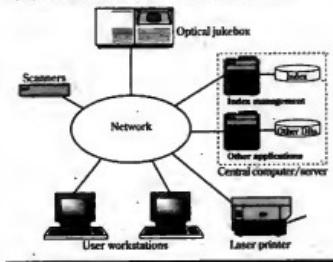
Key to a successful effort is to work closely with users to educate, explore and conceptualize ways in which the technology can be applied and probe the critical details of expected usage, such as how often and in what order documents are needed.

The problem is further complicated by limited experience with large-scale production operations. That makes it difficult to predict performance or operational impact. Furthermore, the cost of document imaging systems is high; thus, mistakes can become quite expensive.

Ultimately, determining whether you have a good application for document imaging should be a business decision, based on a thorough consideration of key factors, such as cost, benefits and risk. The challenge is to assess all the impacts of the technology — including costs, benefits, organisational changes and process changes — and select the best combination of technology, people and procedures. Choices should be based on a clear understanding of business impacts. *

A typical document imaging system

Input from networked devices is displayed on user workstations



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After document imaging, office cartoons?

BY WILLIAM STALLINGS

Voice, data, image. All have been incorporated into the office of today. The next frontier is video, whose arrival in the office environment has already begun. More thinking is starting to take place today about how business can exploit recent leaps in video technology.

Some applications are obvious: more videoconferencing, videophones, video versions of videotext and so on. In pondering all of this, the business decision maker would do well to explore the power of animation. Developments in the entertainment industry can be instructive.

In the past decade, graphic novels — which have been called "cartoon books for adults" — have captured attention in the U.S. The rest of the world, inspired by the graphic novel, has been producing serious, adult animated films for many years.

Until recently, animated film and video in the U.S. was used primarily for children's entertainment. Feature-length animated films were few and far between. Disney films were representative of the genre. A notable exception, and a successful one, was *Who Framed Roger Rabbit*. Buoyed by that movie's success, other full-length animated films will follow.

If animation is valid for entertainment, it can be useful in business as well. Educational and training films can be made more quickly and economically using animation than filming live action. Engineering documen-

tation, advertising material and project proposals are among the many other possibilities. The cost of the hardware related to video transmission and storage has dropped dramatically. Building on advances in static image manipulation (i.e., computer graphics), software is arriving. Already, a substantial body of tools is available for automating the animation process.

True interactive animation, which will allow animated sequences to be created in real time and modified and manipulated as effectively as can now be done with static images, is now in the laboratory and on the threshold of commercial availability.

Developments in several key areas portend the increasing use of video in the office environment:

- **Transmission capacity:** It has never been greater and is still growing. Yesterday's 10M bit/sec. Ethernet is today's 100M bit/sec. FDDI local-area network. High-capacity T1 lines are enjoying increasing use. Broadband Integrated Systems Digital Network, with subscriber loop rates in the hundreds of megabits per second, is within sight.

- **Storage power:** Workstations and personal computers are beginning to offer the processing power to handle images — even moving images — with some facility. Hardware, of course, is getting faster all the time. Software is not far behind. OS/2, for example, was designed to allow device manipulation to bypass the traditional consumer-oriented operating-system mediation that can place unnecessary limits on the fastest of machines.

• **Storage:** Nonerasable and erasable optical media have achieved densities that put massive storage at the command of small office machines.

These three factors have led to the growing use of static or still image processing in the office. IBM's Image Plus system is one example. But several other ingredients are needed to keep moving images advancing in the office.

Compression technology: This is the key. Algorithms that execute quickly and shrink dramatically have been developed for video information. For example, Intel Corp. has developed an optical disc storage algorithm that allows more than 60 minutes of video to be stored on a disk that, up until now, could only store 60 minutes of audio.

Digital/analog compatibility: Digital broadcast television is some way off. But digital transmission of video information is here and improving. As with storage, digital transmission depends on powerful, rapid compression. Video can compress images and transmit them in real time at a wide scale of data rates, with corresponding quality.

The technology for computer-generated animation exists. The hardware and software are now within reach of the small office system, and the possibilities are many. IS managers may find that this intriguing technology is worth a look.

Stallings is president of Comp-Comm Consulting, in Prudential Crossing, Mass.

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* The Wall Street Journal (1987) — "Survey of the Information Processing Marketplace."
 * The Adams Co. (1988) — "Information Systems Management Study."

COMPUTERWORLD

COMPUTER INDUSTRY

INDUSTRY INSIGHT

Peter Bartolik

Money where it matters

With Ronald Reagan, we had the image presidency. How appropriate that his successor is rapidly reconstructing the smoke-and-mirrors presidency.

George Bush is a nice guy, everyone agrees. He's not a Washington-beater, so the beltway crowd thinks everything is just... nice.

Well, if he's so nice, how come he's not picking up the check?

The administration offered a nice high-tech research policy initiative earlier this month, charting out a five-year plan that would cost \$1.9 billion. Unfortunately, there's no commitment that any funding will be made available or even be requested in next year's budget proposal.

There shouldn't be any surprise about this development. After all, why should high-tech fare any better than the war on drugs or any other policy initiatives being run out of the White House these days?

This columnist, for one, is more than happy that we don't have the federal government trying to prime the pump for the supercomputer industry. Sure, the national information network proposal, linking supercomputer centers around the country at high speeds, would be nice to have. But if the only way to get it is to have the U.S. government attempt to shore up the domestic supercomputer industry the same way it "protected" the steel industry, let's "Just say no!"

Unless you've been hiding out under a rock, you should realize by now that there really is not much of a supercomputer industry to prop up, anyway.

Continued on page 115

Stratus trims Q3 projections

BY RICHARD PASTORE
CW STAFF

MARLBORO, Mass. — Stratus Computer, Inc., one of the gunboats of multi-user servers and virtually the last remaining unblemished computer firm in Massachusetts' Rt. 128 high-tech zone, last week scaled back its third-quarter growth and revenue projections by 10 percentage points and \$6 million, respectively.

Stratus, which specializes in fault-tolerant, on-line transaction processing (OLTP) systems, announced that it has revised its third-quarter revenue projection from \$88 million down to \$82 million. It also shaved \$2 million from its original net profit expectation of about \$11 million. In reaction, Stratus' stock value plunged more than 22% last week.

President and Chief Executive Officer William Foster blamed the setback on a weak domestic market. "We are going to manage the company at the 20% to 25% growth level for the



Stratus' Foster scales back estimates

near term unless we see signs of improvement," he said. Stratus at first anticipated 30% to 35% growth over year-earlier levels. Foster said he expects to return to 30% growth by mid-1990.

OLTP is still one of the hot-

test hardware markets going, analysts agreed, although it is being roughed up by the competition. "The problems that have hit the micro, mini and mainframe sectors

Stratus got carried away by its past success, according to Michael Geran, an analyst at Nikko Securities Co. in New York. "They extrapolated a strong second quarter on the assumption that it would be that way all year long," he said. By reconceiving its projections with market fact, the firm "has gone from Polynesian to reality."

In related news, the Securities and Exchange Commission said last week that it will investigate the sales of shares by three Stratus officials that took place one month before the announced earnings revision.

Stratus spokesmen said no officials could have been aware of the revision at that time.

employees last July (see chart below).

Avanti has obtained \$2.5 million in additional financing to take it through 1990, by which time the company hopes to have found a "strategic partner" who will provide Avanti with broader distribution channels as well as research and development funding, Degan said.

However, even with a powerful backer, Avanti will not try to compete again with the high-end switch makers for the Fortune 500 market; instead, it will target Fortune 2,000 companies and carriers, Degan said. The vendor has just announced a low-end TI switch, the ONX 2000, for traffic needs of up to 16 T1 lines.

The main reason that Westar Bank tried the immature ONX 5000 was that the prod-

Datapoint chairman ups ante

BY PATRICIA KEEFE
CW STAFF

SAN ANTONIO, Texas — The fight for control of Datapoint Corp. escalated a notch two weeks ago when Chairman Asher B. Edelman boosted his group's stake in Datapoint from 10.5% to 40%, with the help of two subsidiaries that he controls.

Edelman's buying spree was prompted by attorney Martin S. Ackerman's attempts to unseat him as chairman in a proxy fight in order to shift control of the company to Ackerman and his colleagues. Ackerman reportedly owns approximately 5% of Datapoint's 10 million shares of common stock.

"The feeling here is that if it was tough for Ackerman when Edelman only owned 10% of the company, what chance (of a takeover) does Ackerman possibly have now?" said a Datapoint executive who asked not to be named.

Ackerman has until Nov. 6 to secure the approval of more than 50% of Datapoint stockholders.

Continued on page 118

Avanti tries comeback after total makeover

BY ELISABETH HORWITT
CW STAFF

NORWOOD, Mass. — After two years of flat sales, red ink and product glitches, Avanti Communications Corp. is attempting to resurrect itself with a self-improvement plan that is far more than just a face-lift.

"Avanti is a brand-new company now, since they have basically swapped out 80% of their staff in the last 18 months," said Richard Malone, a principal at Dedham, Mass., research company Vertical Systems Group.

In the past few months, the T1 switch vendor has acquired several management addressees, finalized a new entry-level product, a revamped marketing strategy and a new headquarters location that is closer to strategic accounts than Avanti's former site in Newport, R.I., company spokesman said.

The 13-year-old firm has been losing money during the past two years, primarily because of the cost of introducing and then debugging its Open Network Exchange (ONX) 5000, according to Robert Degan, Avanti's recently appointed

president and chief executive officer.

Introduced in 1987, the high-end switch was a crucial part of Avanti's strategy for competing with such leading vendors as Network Equipment Technologies, Inc. and Timeplex, Inc. in the Fortune 500 market. But after selling the ONX 5000 to only seven customers, Avanti put further marketing plans on hold while it addressed software glitches that made the switch unreliable at times, Degan said.

A major milestone for Avanti was the release in June of new software that fixed the problem, Degan said. National Western Bell, which has suffered from routing glitches since it bought the ONX 5000 two years ago, has found the product to be "rock solid" since the new software was installed, said Brian Siegel, the bank's vice-president of data communications.

Making its high-end product viable was only one crucial piece of Avanti's game plan for becoming profitable by the fourth quarter. The company recently underwent a major reorganization, replacing four top managers and dismissing about 30% of its em-

ployees last July (see chart below).

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The main reason that Westar Bank tried the immature ONX 5000 was that the prod-

Self-help plan

Avanti Communications hopes steps taken in recent months will turn its fortunes around

- January 1988: President Tom Taylor resigns. Followed in subsequent months by heads of engineering, sales and marketing.
- June 1989: New software released to fix ONX 5000 glitches.
- June 1989: Robert Degan appointed president and CEO; VPs of engineering, sales and finance hired. Approximately 30% of employees laid off.
- August 1989: \$2.5 million financing raised. First "break-even month" in two years.
- September 1989: Entry-level TI switch announced

Inside

- TI workers flock to early retirement offer. Page 114.
- Leading Edge reorganizes. Page 115.
- DEC execs who wants to sever themselves voluntarily. Page 118.

IN BRIEF

Dear Diary

Apple Computer, Inc., announced last week that co-Wing Loebenstein, Inc., executive has Diery will succeed Dabert Yeznes as senior vice-president and president of Apple Pacific. Diery, 36, is 11-year Wang veteran with extensive experience in international markets, most recently served as executive vice-president of Wang's worldwide field operations. In that post, he was responsible for Wang operations in Europe, Africa and the Middle East.

Stumbling Block

H & R Block, Inc. has hedged its bid for MicroBilt Corp., the San Diego-based company. After MicroBilt turned in a lower-than-expected performance for the six months ended July 31, Block revised its bid, offering MicroBilt shareholders \$14 worth of Block common stock per MicroBilt common share plus another \$4 worth if MicroBilt's earnings in the next 12 months exceed those of the last 12. Block had previously promised MicroBilt shareholders \$18 per share.

Oracle joins Sematech boosters

Oracle Corp. last week signed on with Sematech, an association of suppliers to the semiconductor industry dedicated to helping the U.S. regain its lead there. Oracle's role will be to provide Sematech-member semiconductor manufacturers with companywide integration via its distributed database management system.

Landmark decision

Landmark Graphics Corp. announced last week because of product confusion and customer service, declining sales in the computer-aided exploration workstation market, it has lowered its current-quarter earnings projections from 24 cents per share to about 20 cents per share. To ease customer concerns about being burdened with suddenly outdated technology, Landmark has guaranteed its customers a free hardware upgrade to more advanced Landmark introductions within the following 12 months.

Adobe checks in

Adobe Systems, Inc. announced robust earnings growth for its third quarter ended Sept. 1. Revenue was \$30 million, up 19% from the year earlier. Net income was \$1 million, an increase of 43% over last year's like quarter. The company noted that Apple accounted for slightly less than 25% of its total revenue for the quarter.

Too many takers for TI's early retirement bid

BY ELLIS BOOKER
CW STAFF

DALLAS — A voluntary early retirement offer that attracted more takers than expected will cost Texas Instruments, Inc. about \$10 million in the third quarter, the company told a group of Dallas investment analysts two weeks ago.

The retirement scheme, announced in August by TI's Defense Systems & Electronics Group, was part of a work force reduction that included the layoff of 130 people at the company's metal fabrication operation in Colorado Springs, Colo., and the termination of 100 additional employ-

ees at facilities elsewhere around the U.S. Another 200 to 400 employees had been expected to take the early retirement and termination package. However, approximately 700 signed up for the program, which ended Aug. 25.

Staff cuts needed

More significant than the third-quarter charge was the need to cut staff in the first place, analysts said.

"It represents a continuation of sluggish revenues and earnings pressure in the military electronics area," said James L. Barlage, managing director of research at Smith Barney, Harris Upham & Co. in

New York.

Bralage, who estimated the third-quarter charge to be about 10 cents per share, described TI's defense and electronics group as "one of the most dynamic areas over the past 10 years" and said compound annual revenue for this operation averaged 17%, far outpacing the growth for the rest of the company.

However, given political pressure to pare down the U.S. defense budget and an apparent thawing in the Cold War, this growth pattern cannot be sustained, Bralage said. "In my view," he concluded, "the best you'll get out of this area is flat growth."

INFO WORLD

PC WEEK

PC MAGAZINE

PC LABS Selects
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MultiModem as
Editor's Choice

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Multi-Tech
MultiModem Wins
Hands Down.
”

“
Poll of Corporate
Satisfaction:
MultiModem Ties for
Top Overall Score.
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The results are in, and not one, but four of the industry's leading publications name Multi-Tech as the modem of choice.

Magazine editors and corporate buyers alike put nearly every modem on the market under close, demanding scrutiny.

"Solid buy" . . . "Top performer" . . . "Stew of extras" . . . "Well built" . . . "The price is right" . . . these are phrases used by reviewers to describe the Multi-Tech MultiModem.

Editors at PC MAGAZINE in a review of 87 modems chose Multi-Tech for their Editor's Choice. Corporate buyers surveyed by PC WEEK gave Multi-Tech their highest scores for quality, overall performance and organized documentation. INFOWORLD, in a detailed line impairment testing, named Multi-Tech the unquestionable "top performer." And results of the DATA COMMUNICATIONS Datapro User Review prompted editors to comment, "It's no wonder that Multi-Tech's performance and market share continue to grow."

Daewoo pulls Leading Edge away from bankruptcy brink

BY ALAN J. RYAN
CW STAFF

CANTON, Mass. — It was cheap champagne for everyone when Leading Edge Products, Inc.'s reorganization plan was approved by U.S. Bankruptcy Court Chief Judge James N. Gabriel in Boston recently.

Leading Edge had been operating under Chapter 11 bankruptcy protection since February. Under the terms of the

plan, which will take effect in mid-October, the more than 400 creditors will be paid 100% of what they are owed in Leading Edge products over the next four years. The plan will be funded by Daewoo Telecom, Inc., the South Korea-based manufacturer of Leading Edge personal computers.

According to Daewoo Telecom's business plan, Leading Edge expects to increase its revenue to \$600 million in five years. During the most recent 3½ years,

Leading Edge sold \$470 million of the Daewoo products. Daewoo Telecom is a subsidiary of the \$13 billion Korean conglomerate Daewoo Corp.

Dealers' edge

Most of the Leading Edge creditors are dealers, and they approved the plan with a nearly unanimous vote, according to John R. Sullivan, the newly appointed chief operating officer of Leading Edge.

The dealers will be paid 25% in products soon after the effective date of the plan and will then receive 18.75% in products owed on each subsequent anniversary for four years.

With the confirmation of the business plan, Leading Edge will now move to actually put it into effect. Approval from the

South Korea ministry of trade and other U.S. government approvals are in process, Sullivan said. Such approvals "give Daewoo Telecom the opportunity to move cash from South Korea into the U.S., which will be used for the first wave of payments to creditors," he said.

Leading Edge, once a highly visible and profitable clone maker, had accumulated debts of \$16.5 million by February. Sullivan said last week's approval from Gabriel was a positive step toward his goal of seeing the company once again become a major player.

Last week, though, the celebrators at the company's Canton headquarters had to settle for inexpensive champagne. "We're not out of the hole yet," Sullivan said.

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Bartolik

CONTINUED FROM PAGE 113

Cray Research, in fact, has very little domestic competition for the very few supercomputer customers. Rather than effectively subsidize a domestic monopoly, let's let this niche industry take on a little foreign competition, or even a lot.

And if it can't keep up with the NECs and Fujitsus of the world? C'est la vie.

U.S. industry has already turned up its nose at the promise supercomputers supposedly hold. The bigger-is-better mentality has gone the way of the New Deal, with smaller, more powerful technology providing a plethora of computing alternatives.

Well, some will argue, what about the needs of our secret intelligence agencies and other vital government bodies that rely on Cray for unique processing functions? Too bad! There are plenty of new technologies under development that could use what is effectively the subsidy that government business has provided Cray over the years. Cray is not in any sense of the word a strategic start-up, and it's time for it to stand on its own two feet; if it can't, then the machines it provides may not be a cost-effective tool for government agencies, anyway.

The current clamor to protect our domestic supercomputer industry—and if you read between the lines, it is clearly a call to protect Cray—is an argument that this industry doesn't have what it takes to go it alone. Government protection, one way or another, amounts to government subsidization.

This is not to say that the U.S. government should not use its vast procurement pockets to assist budding domestic technology wunderkinds. Government funding has always been a valuable resource for technological start-ups, but at some point such ventures have to be able to make a go of it in the commercial world.

Here's one taxpayer that would just as soon not see the federal bureaucracy bogged down in a wrangle about the merits of whether we need to broadcast the rest of the world over a very selective niche of the computer industry.

The effort would be much better spent trying to resolve issues that really mean something to the social fabric of the country, such as the war on drugs, homelessness, and the ongoing democratization of Iran. Certain countries, Tell Bush, in a nice way, to put the money where it counts.

Bartolik is Computerworld's arts editor.

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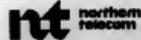
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THE POWER BEHIND A BETTER BUSINESS

Datapoint

FROM PAGE 113

for his bid to wrest control from Edelman.

In a press release issued earlier this month, Ackerman, who is chief executive officer of a computer distributorship, Authorized Distribution Network, Inc., claimed that his team could do a

better job than Edelman has done in returning Datapoint to profitability.

The local-area network supplier recorded seven consecutive profitable quarters before incurring a \$20 million loss in the third quarter of fiscal 1989. The fiscal year ended July 31, and Datapoint is expected to release year-end and fourth-quarter results within two weeks.

Ackerman filed a Schedule 14B petition with the Securities and Exchange Commission (SEC) earlier this month charging that since Edelman took over Datapoint in 1985, the firm has seen the value of its stock plummet 58%, its bottom line go up 58%, and its coffers tapped for speculation in other companies' securities. The inconsistency between the seven profitable quar-

ters and Ackerman's charges of what is explained in part by the fact that Datapoint's board consistently issues dividends or preferred shares. For example, last year's \$9.8 million dividend payout wiped out an \$8 million net profit for the year, the source confirmed.

The battle, complete with dueling SEC filings, has the odd effect of turning the tables on arbi-

trageur Edelman, who ordinarily casts himself in the role of the aggressor. Edelman, a takeover raider who tends to purchase companies and then sell off various units in order to reap a tidy profit, could not be reached for comment.

Edelman successfully engineered a hostile takeover of Datapoint in July 1985, later spinning off the firm's service business as a separate company called Interlogic Trace, Inc. He retained chairmanship of significant equity positions in both firms.

A leveraged buyout attempt for \$6 per share followed in September 1985 and was later withdrawn in May 1986. In April 1988, Edelman, backed by a group of management-level executives and investors, took a second stab at soliciting a buyout, also for \$6 per share. That offer was also rejected.

Since purchasing Datapoint, Edelman has continued his investment activities through a separate firm called Arbitrage Securities Co.

DEC offers voluntary severance

BY MARYFRAN JOHNSON
CW STAFF

MAYNARD, Mass. — Hoping to trim its ranks of 700 manufacturing employees in New Hampshire and Massachusetts, Digital Equipment Corp. earlier this month offered a voluntary severance plan to encourage people to leave the company.

Employees at a DEC manufacturing facility in Salem, N.H., and a half-dozen associated businesses were gathered in small groups and told about the "fifth option" — a financial support package offering from 40 to 104 weeks' pay, one year of insurance coverage after they resign and help in finding a new job.

"There is no intention of having this become a companywide problem," says Jeffrey Gibson, a DEC spokesman.

DEC is in the midst of shifting 4,000 employees away from manufacturing and into sales and service. The four other options being offered are redeployment to another job, retraining, temporary assignment or additional education and training courses.

Within the past year, the DEC facility in Salem was "rechartered" from its original use as a final assembly and testing plant to a home for the computer special systems manufacturing group. Since November 1988, some 600 employees in the assembly and testing unit have moved on.

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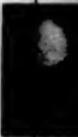
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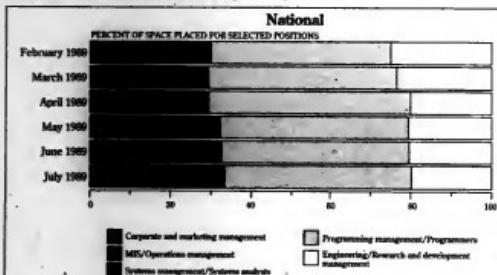
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Computer recruitment advertising activity*



*Analysis of computer recruitment advertising space in Computerworld and selected major U.S. newspapers

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MARKETPLACE

Putting systems out to pasture

To get rid of an old computer, users have several options at their disposal

BY MICHAEL ERPSCHLOE
SPECIAL TO CR

If you are planning to buy a new computer, you not only have to determine the best way to finance your new machine, but you must also decide how to dispose of your current one.

In making the decision, you will probably be dealing with equipment that falls into one of three categories:

- It is very old and has little, if any, value.
- It has been completely depreciated but has some value.
- It has not been completely depreciated, and you may still face lease payments or other financial obligations on it.

Equipment is generally defined as obsolete if maintenance for it is no longer available from the original manufacturer; third-party maintenance is getting more difficult, and replacement parts are becoming harder to find. In this situation, you may find that it will cost more to have your equipment removed than to dispose of it yourself. However, there are some options to consider.

Some companies donate old equipment to schools or charitable groups. The organizations usually cannot use the systems

but sell them to raise funds. Do not be surprised if such offers are not met with a positive response, however. Not all of the organizations possess the skills or the knowledge to deal with such a contribution. Nevertheless, the approach is still worth checking out.

In addition, there is an emerging group of computer equipment scrap dealers that may be interested in your system. Several of them advertise in trade publications. Depending on your equipment, you may find they pay fairly well for old machines.

The dealers concentrate on systems that were very popular and are still in use, kept alive by third-party maintenance firms. The IBM Series/1 and System/34, 36 and 38 are prominent examples, as are the older Digital Equipment Corp. PDPMs. The recyclers dismantle the machines and sell parts to the maintenance companies.

Middle-aged equipment
Selling middle-aged equipment can be more of a challenge. If the installed base for a system is small, it actually falls into the obsolete category.

For more popular machines, there might be other users interested in an inexpensive source of

parts or replacement peripherals. These users are likely to be found among mid-size manufacturers that use the systems for production or related jobs such as inventory control. Interested companies are generally satisfied with the equipment and do

much more complicated.

Your company may only upgrade a system — rather than replace it — in order to lengthen its useful life and obtain some of the benefits of newer technology while delaying conversion costs and disposition difficulties. This approach would leave you with just a few pieces of equipment to dispose of and thus fewer headaches; however, it would also lower the trade-in or cash value of that equipment because of the

termination payment or book loss. However, subleasing does not provide the cash to immediately reinvest in new equipment.

Trade-ins. A trade-in avoids the need to report or realize large cash or book losses. On the other hand, it may add to expenses if the interest under the refinancing is greater than the rate due under your previous lease contract.

However, you may be able to use a trade-in to exert leverage with manufacturers that want to sell new equipment and discontinued maintenance of older systems. These manufacturers often make special allowances for trade-ins when they want to push new technology, increase revenue or avoid the need to hire maintenance workers for new systems by eliminating the ones they currently support.

Ertuschko is a managing editor at Computer Economics, Inc., in Cupertino, Calif.

IF YOU ARE REPLACING equipment that is not completely paid for or depreciated or that retains some cash value, your situation can be much more complicated.

not want to spend money on upgrades or conversions. They often use small DEC VAXs, IBM System/34, 36 or 38s and 4300s or older Hewlett-Packard Co. equipment.

Start-ups may also be interested in such systems because the owners have the skills and knowledge to run them and little need to invest in the latest technology. Informal networks may be the best source of information on these opportunities.

Newer equipment
If you are replacing equipment that is not completely paid for or depreciated or that retains some cash value, your situation can be

small scale of the transactions.

In practical terms, there are three ways to dispose of computer systems that fall into this final category:

Cash sale. The advantages of this approach are immediate cash in hand and ease of negotiation and administration. The disadvantages are a potential loss of federal investment tax credits, unacceptable book losses or a low return if you do not have the time to find a buyer that will pay you a good price.

Sublease. Subleasing computer equipment is usually done through a broker, dealer or third-party lessor. Its advantages are avoiding a large lease

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The BoCoEx index on used computers

Closing prices report for the week ending September 15, 1989

	Closing price	Recent high	Recent low
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XT Model 086	\$725	\$1,150	\$700
XT Model 088	\$1,025	\$1,400	\$960
AT Model 099	\$1,325	\$1,850	\$1,400
AT Model 230	\$1,700	\$2,100	\$1,700
AT Model 330	\$1,750	\$2,000	\$1,700
PS/2 Model 50	\$1,675	\$2,000	\$1,600
PS/2 Model 60	\$2,625	\$3,300	\$2,500
Compaq Portable I	\$475	\$750	\$325
Portable II	\$1,700	\$3,000	\$1,650
Portable III	\$2,425	\$2,800	\$2,300
Portable 200	\$1,800	\$2,000	\$1,600
Plus	\$750	\$1,300	\$675
Desktop 200	\$2,025	\$2,350	\$1,700
Desktop 300	\$2,750	\$2,900	\$2,500
Apple Macintosh 512	\$500	\$650	\$300
512E	\$550	\$925	\$450
II	\$1,050	\$1,150	\$750
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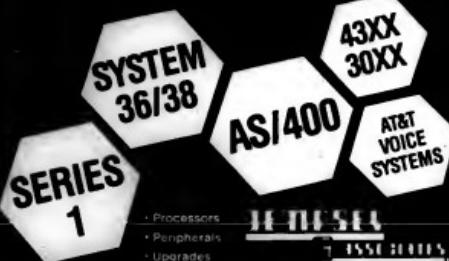
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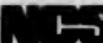
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TRAINING

Expert systems as teachers

They can lend a whole new meaning to the concept of on-the-job training

BY JESSICA KEYES
SPECIAL TO CWT

In this age of business flux and changing lifestyles, it is not unusual to find companies plagued by double-digit turnover and the consequent skyrocketing of training costs.

One possible response to this kind of problem is to turn to intelligent computer-assisted learning (ICAL), touted as a new artificial intelligence version of computer-based training (CBT). ICAL provides individual instruction, immediate response for remedial learning and reinforcement and measurement of student replies.

However, senior management might cringe at the bill. According to Behavorteach, Inc., an Oak Brook, Ill., vendor of CBT, ICAL development costs can exceed \$8,000 per course hour. Off-the-shelf CBT, by contrast, might cost less than \$100 per course hour.

Fortunately, there is an alternative to ICAL — expert systems. One of the main selling points for expert systems tech-

nology is its role as advisor; in fact, many of the systems are so dubbed. Examples include NCR Corp.'s Design Advisor for developing integrated circuits and Du Pont Co.'s Packaging Advisor for creating plastic food containers. Technology is already available to do better with a lack of knowledge, even if it was not originally designed for training.

How can companies put expert systems tools to work in training? The key to building good training systems is to provide not only the "how" but also the "why," and expert systems can do this rather nicely.

Built into most expert system shells are two features typically known as "explain" and "why." Their use can be illustrated by an advisory system for training new warehouse supervisors in the intricacies of restocking. Neophytes could press the "explain" key to learn more about inventories recorded for items. They could hit the "why" key when the system asks questions about, for example, the weather or the location of the warehouse. It turns out that customers make

bigger purchases in the fall in, say, the Southeast.

These expert systems, or real-time training systems, are also being used to great advantage in such far-flung disciplines as credit authorization, tax advising, mortgage authorization

However, there is another type of training challenge. Imagine for a moment a new crew of trainees who have been sent off for a week of CBT instruction on the tools of the trade. A week later, they arrive at their offices to discover a frantic work pace — telephones ringing, meetings on the hour — and no time for training. They have to perform, now.

We are talking about the knowledge of the trade rather than its tools, and it must be ab-

stract members of the exchange.

A user of this system, for example, might need to examine whether there was a problem with the value of the stocks a brokerage was holding compared with the brokerage firm's net capital. One rule calls for entry of the names of the stocks held, generates their current market value and compares that amount with the net capital.

If a veteran user is asked what stocks are being held, he quickly responds because he knows the techniques of financial analysis. A novice, on the other hand, presses the "why" key on his terminal and the system explains why the question is being asked. The novice feels a little better — he now understands and gives the answer. When the system responds that there is a problem, the novice presses the "how" key and the system explains how it arrived at the conclusion — real knowledge in real time.

The training designer has many choices. Expert systems can provide a real-time approach to taming the training beast within the context of the real world that has to get done.

Keyes is managing director of technology for the New York Stock Exchange and a frequent contributor to technology publications.

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Computers track Hugo's frenzy

BY MARYFRAN JOHNSON
OF STAFF

CORAL GABLES, Fla. — Back when it was just a cluster of clouds and a few churning waves off the western coast of Africa, Hurricane Hugo caught the eye of the National Hurricane Center.

By Friday morning, Hugo had grown powerful enough to pulverize Charleston, S.C., leaving in its wake 85% of the city powerless; 30 major buildings leveled and a 50-foot boat deposited in the middle of a street.

As the mammoth storm developed during the past two weeks, a Geostationary Orbiting Environmental Satellite beamed digital images of the storm to an IBM mainframe at a federal facility in Wallops Island, Va. Within one second, the data was manipulated, rebroadcast via satellite and bounced back down to the antenna feeding into an IBM 4381, which was located at the

heart of hurricane tracking.

That is where Sylvia Graff and other meteorologists at the hurricane center spotted "that certain signature," warning them that a tropical cyclone was in the making.

Two weeks later, Hugo had blown up into a killer with winds gusting up to 140 miles per hour, devastating parts of Puerto Rico and the Virgin Islands before, slamming into South Carolina.

Seen of the pants

Despite stunning advances in computer power over the past decade — providing more accurate images and volumes of detailed data faster than ever before — meteorologists still rely to a certain degree on "seat-of-the-pants forecasting" when it comes to a deadly force like Hugo.

"It would be neat to say we crank in the numbers, and there they are. But it doesn't work that way," said Graff, a 20-year veter-

an in hurricane tracking.

Nevertheless, the tracking system provided enough warning for data centers in the Charleston area to prepare for the worst as early as Tuesday last week.

According to spokesman at disaster recovery service firms Condico, Inc. and Sungard Recovery Services, Inc., at least 10 subscribers in the area put the services on official alert for potential disaster.

At least one Charleston data center received serious water damage to the building and was unable to declare a disaster, according to Ray Hagg, president of Disaster Recovery Services at Condico.

"We've been in touch with our customers there, and so far, none have officially declared a disaster," Hagg said midday Friday. "But we expect to know more later and anticipate at least one company to declare."

At Westinghouse Electric

Corp. in Hampton, S.C., 70 miles from Charleston, MIS Manager Bob Boller initiated down the hatches late yesterday afternoon by pulling the full gull hook.

He shut down the power on his Hewlett-Packard Co. 3000 Model 9655 by 8 p.m. Westinghouse suffered no damage, according to Boller, who managed to fight his way to work Friday morning.

The newest software capabilities in weather recovery service firms Condico, Inc. and Sungard Recovery Services, Inc., at least 10 subscribers in the area put the services on official alert for potential disaster.

"The technology for acquiring [weather] data has not changed," said Jerry Ennesen, a professor of meteorology at MIT. Advances in workstation technology have particularly helped in analysis of complex, four-dimensional data sets, he noted.

The hurricane center's technological base rests on one IBM mainframe, a Data General Corp. \$140 Eclipse minicomputer.

er and an eclectic collection of personal computers — running mostly software written in-house by National Oceanic and Atmospheric Administration scientists.

But the true heart of the operation is the Modes System, a meteorological data processing system designed by the University of Wisconsin's Space Science and Engineering Center.

Through the proprietary Modes preprocessor embedded in the IBM mainframe, the system receives and manipulates the staggering amount of data a weather satellite generates. A full globe image, at full resolution, takes up 223M bytes of memory.

Only this year did the hurricane center obtain its own mainframe and the first of four Modes workstations, allowing it to acquire satellite data locally rather than waiting for a remote mainframe in Virginia to pipe images — with agonizing slowness — down a 9.6K bit/sec. communications link.

Staff writer Richard Pantzer contributed to this report.

Mac

FROM PAGE 1

display technology slowed the developmental process.

The portable incorporates all the traditional Macintosh features into a trim carry-along size. The only hefty elements of the machine are its price and weight: Entry-level models sell for \$5,799 and weigh 13% pounds, while a 40-Mbyte hard-drive version costs \$6,499 and weighs 15% pounds.

Apple executives said those sacrifices were necessary. "We wanted no compromises, no Mac Jr.," said Jean-Louis Gassée, president of Apple Products, who added that trimming of a few pounds was less important than providing full Macintosh functionality.

Most users agreed, saying that function was the most important element they were concerned with. "Yes, it's expensive, but a true portable Mac is really needed. Besides, it's peanuts if it can make a senior executive earning \$150,000 a year more productive," said Rick Christensen, manager of automation support at the Milwaukee Corp. Technical Center in Denver.

Mike Bailey, systems integrator at Lockheed Missiles and Space Corp. in Sunnyvale, Calif., said the portable is better than what he is lugging around now. "Currently, I had around an SE; it's too bulky but better than nothing," he said. "When you connect another portable to a Mac network, it seems like a waste of time."

Analysts downplayed the price and weight issues. "It's a

Pack a Mac

Apple's Macintosh portable features a built-in trackball pointer and a hefty weight and price



Processors:

- Motorola CMOS 68000, 16MHz

Power:

- Lead acid batteries, 6-12 hours

Display:

- Active matrix LCD, 640 x 400

Memory:

- 1.5-Mbyte RAM

Storage:

- 1.4-Mbyte diskette: 40 M-byte hard drive optional

Weight:

- 15.7 lbs. with battery and hard disk

Price:

- \$5,799, \$6,499 with hard disk

WEIGHT: 6.5 POUNDS
DISPLAY: 9 INCHES
RESOLUTION: 640 X 400
SCANNING: 16.7 HZ
BATTERY: 6-12 HOURS
POWER SOURCE: BATTERIES
DIMENSIONS: 14.5 X 10.5 X 3.5 INCHES

very impressive portable, and Compaq has proven that users are willing to pay a few extra dollars for a fully functional machine," said Michele Preston, an analyst at Salomon Brothers, Inc., a research firm in New York.

Preston also speculated that the high cost of the machine may have been devised in order to avoid the possibility of the portable stealing sales away from lower-priced Macintosh SE models.

The portable uses an active-matrix LCD, which means that both head and panel are transistors. The screen can be viewed head-on or from either side and offers

sharper images and less image bleeding than many other portables.

Instead of the Mac's traditional mouse, the portable has an integrated trackball that can be positioned on either side of the keyboard to accommodate left- or right-handed users. An optional mouse is also available.

A 1-Mbyte static random-access memory chip tape into a sealed lead-acid battery — the same technology used in automobiles — and provides up to 12 hours of power. A built-in modem is also included.

The Mac ICI is a high-powered extension of the IICX which has become the fastest selling product in Apple's product family since its introduction in March. The ICI runs at 25 MHz and does such new capabilities as built-in video. Pricing begins at \$5,299.

The ICI further blurs the dividing line between personal computers and workstations and gives Apple users a leg up in power.

"With the 16-MHz ICI and 25-MHz ICI, Apple users have the same kinds of performance choices as do the Intel processor users," said Andrew Seybold, president of Andrew Seybold's Computer Insiders in Santa Clara, Calif. "The Motorola Corp.'s 68030 running at 25 MHz will perform as well if not better than the 80386 running at 33 MHz."

Apple officials claim both machines have already received a warm welcome from users. Allen Lorenz, president of Apple USA, says that Cupertino, Calif.-based company has received 20,000 orders for both machines, representing \$100 million in revenue.

Telecom forum offers users tailoring options

BY ELISABETH HORWITT
CWT STAFF

SAN DIEGO — This week's Tele-Communications Association '89 conference could lend a hand to the telecommunications manager whose budget belt has been tightened of late.

Several announcements expected at the show were designed to give users more options for tailoring communications offerings to the needs of a given site — and then integrating those offerings under one management system.

Among the more prominent products and services expected to be introduced at the show are the following:

- U.S. Sprint Communications Co. is expected to announce general availability of its Clearline Fractional T 1.5 service, which targets sites that can cost-justify several 56K bit/sec. channels but not full T 1.

- AT&T Paradyne is slated to announce a network management system that provides users with a foundation for integrating AT&T and Paradyne's respective data communications product lines, according to the AT&T subsidiary's executive vice-president, John Miller.

- The 6800 series is a windows-based graphics-driven system that is used to monitor, collect and analyze data and configure AT&T and Paradyne's modern multiplexers and channel-service units. The 6800 is also said to

manage Paradyne's host channel extender units via a terminal interface.

No people

The 6800 will use AT&T's Network Management Protocol to automatically upload configuration changes to the Accumaster Integrator's database as they happen without human intervention, he added.

The 6800 runs on an AT&T workstation based on the Intel Corp. 80386 chip or 80286 microcomputer and is priced between \$20,000 and \$100,000 or more. Availability is scheduled for the fourth quarter of 1989.

Bytex Corp. is scheduled to introduce its Remote Center Management, an IBM Personal Computer-based system that is said to provide centralized management functions such as test initiation and performance monitoring to Bytex matrix switches at remote sites.

Bytex is also expected to announce Unity Digital Network Switch, a T1 networking switch that reportedly supports fractional T 1.

• Telematic International, Inc. is expected to announce what may be the first software package to allow intelligent interconnection between carrier-based and private packet-switched networks. The tool would allow functions such as security, filtering, call admission and intelligent routing to be implemented across a hybrid network.

Other developers will play, too

BY AMY CORTESE
CW STAFF

Although only three computer-aided software engineering (CASE) vendors shared center stage with IBM's AD/Cycle, there were no hard feelings evident from the rest, as more than 20 companies joined in with a resounding "Me, too," pledging support for AD/Cycle and promising OS/2-based tools.

AD/Cycle, and more specifically the Repository Manager, vendors said, give the industry standards help both vendors and users," agreed Michael Watters, manager of Texas Instruments, Inc.'s Advanced Information Management.

However, there was uncertainty as to what exactly those standards are and when more detailed information will be forthcoming from IBM.

In the near term, the two most accessible targets for development are IBM's own User Access and the OS/2 platform, Watters said. But vendors were unclear as to when the information model — which applications working with the repository will use — would be finalized.

Glover Ferguson, director of

development for Andersen Consulting's CASE product, Foundation, said there may be some portions of the model out in June, when the repository is scheduled to ship, but that IBM was vague about what would be included in the first release.

Supporting cast

Product

Development

- Business modeling and prototyping tool

Software Analysis Test Tool

- Verification and validation tool

Workstation Interactive Test Tool

- Automatically records and replays interactive application test sessions

Data Extract/DI

- Extracts data from a DEC VMS system and moves it to an IBM system

Dictionary Model Transformer

- Transfers information from IBM OS/2/DC Data Dictionary to Repository Manager/MVS

■ ■ ■ ■ ■

In the meantime, CASE vendors with repository-like products or their own and they intend to continue using them with an eye toward migrating to the Repository Manager when it is available.

Ferguson said his company will give customers the option of using its own version of IBM's small Repository Manager "at least as functional as our own." However, he added, "We don't have assurance that will be in June." When that time does come, Andersen will provide a migration from its proprietary repository to IBM's.

Ferguson said the Foundation tools go through access services to reach the repository, so it would be a matter of rewriting them to work with IBM's repository without requiring changing the tools themselves.

While most vendors concurred

dent of product development at Sage Software, Inc., said that while IBM's Cross System Product focuses on a least common denominator approach to generating code for multiple IBM environments, Sage's tool generates native Cobol code optimized for the particular environment.

Judging from user reaction, AD/Cycle is opening opportunities for all CASE vendors, not just those on the inner fold.

John Voss, vice-president of systems integration at Huntington Service Co., a division of Huntington Bancshares, Inc. in Columbus, Ohio, said he missed the IBM customer meeting because he wanted to be around when a major new on-line bank-

ing system using TI's Information Engineering Facility tools went on-line.

While Voss said he is considering products from Bachman Information Systems, Inc., one of IBM's CASE partners, the decision is based on the products themselves and not because IBM chose them.

Likewise, William McClatchie, manager of Information Resource Management at G.E. Plastics in Pittsfield, Mass., was disappointed with IBM's announcement. He said he will look at other third-party offerings. "Our wait-and-see attitude prior to the announcement is becoming more of a look-elsewhere attitude."

IBM tosses in upgraded 4GL to mixed reviews

BY ROBERT MORAN
CW STAFF

As part of its AD/Cycle strategy, IBM introduced an upgraded Cross-System Product (CSP), revamping its sidelined fourth-generation language (4GL) by turning it into a compiler.

According to Aaron Werman, president of Data Connect, Inc., a New York consultant specializing in DB2, IBM finally has a legitimizing 4GL for the first time. "For the next two years, there will be a bloodbath pointed at other products on the market," he said.

CSP Version 3 Release 3, scheduled to be available in June 1990, runs on a programmable workstation, providing a graphical interface that supports application definitions. It also provides an external source format in which to hook vendor tools. IBM also introduced CSP/370, which generates VS Cobol II applications programs using the application definition function of CSP.

Bill Werbin, vice-president of wholesale information systems development at Manufacturers Hanover Trust in New York, said that although IBM announced CSP and CSP/370 for Cobol generation, it did not announce when it will link CSP to its repository product.

Nevertheless, Werbin said he was encouraged by the announcement because he is a CSP user. "I limited my use of CSP to low-volume transaction processing functions," he said. "The benefits in terms of development are there, but CSP contains overhead when executing it in production environments."

Other analysts gave CSP a mixed review. Jeff Tash, president of Database Decisions, Inc., a consultancy in Andover, Mass., said the "product is terrible," because "the Cobol piece will

Baxter, IBM merge in health care

BY ELLIS BOOKER
CW STAFF

The \$4 billion market for health care information products and services will deliver the news of a new baby last week.

IBM and Baxter Healthcare Corp. in Chicago announced a 50-50 partnership merging their separate health care information operations. The new-as-yet unnamed company will focus on the broad spectrum of customers, from doctors' offices to large, multi-building medical centers and it will offer enterprisewide and department-level computing products, said Frank Russo Jr., former head of Baxter's Systems Division. He will become president and chief executive officer of the new company.

The partnership calls for Baxter to contribute its Systems Division, which had been responsible for marketing software and services to large hospitals, and its physician computer systems. Some 800 Baxter employees will join the new startup.

IBM will contribute its existing line of health care-specific applications systems. IBM also will open four "health industry solution cen-

ters" across the country — in Washington, D.C., Dallas, Chicago and Los Angeles — to aid the new entity's independent marketing force, which will be in contact with IBM's worldwide marketing forces.

"Baxter has been a business partner of IBM for years as a reseller of IBM hardware, and frankly we've been attempting to improve the relationship," Russo said. He added that IBM provides "marketing leverage" and the ability to cooperate on future products that address research-and-development-intensive clinical systems. In addition, IBM affords Baxter a "world-wide sales force," he said.

The merger is significant in the health care industry, which just six months ago saw the formation of McDonald Douglas' health care group to American Express, and Sheldon L. Dorenfest, president of Sheldon L. Dorenfest & Associates Ltd., a Northbrook, Ill., health care consultancy. The problem, Dorenfest said, has been that suppliers of health care information systems "have been deviating" from the products the market demands, particularly in the insurance industry, he said. He added that the necessary R&D investment to fix existing product lines while bringing out new products is too high for many players.

Nevertheless, Werbin said he was encouraged by the announcement because he is a CSP user. "I limited my use of CSP to low-volume transaction processing functions," he said. "The benefits in terms of development are there, but CSP contains overhead when executing it in production environments."

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AD/Cycle

FROM PAGE 1

building, designing, testing, producing and maintaining applications. However, analysts said that IBM is addressing only business modeling functions and that the theoretical scaffolding will not be enough for some users.

Observers said the announcement signals IBM's stamp of approval for computer-aided software engineering (CASE) technology to tackle the backlog and sets the stage for years of technological innovation and product announcements.

Bill Werbin, vice-president of wholesale information systems development at Manufacturers Hanover Trust in New York, said he was encouraged by the announcement, particularly by IBM's partnership with Bachman Information Systems, Inc. and Index Technology Corp., but that he was "still disappointed with the status of the repository." He said the release will have limited functionality and

as an interface to entity relationship and object services tools provided by itself and its three business partners.

Prices are based on IBM processor groups and range from a one-time charge of \$94,080 to \$243,000.

Analysts painted AD/Cycle as a mainframe announcement, falling short of its proposed reach to all SAA platforms and lacking a specific schedule for when it will become available for both the VM environments and OS/400.

Further-reaching goals were cited by IBM officials, but in the vague scheduling terminology that has plagued other corporate SAA announcements. "Over time, most of the 700,000 lines of code will move over to VM unchanged," said Earl Wheeler, IBM's vice-president and general manager of programming systems.

Last week, IBM announced 21 new or enhanced tools and services and enlisted the service of three business partners to provide OS/2 Extended Edition versions of their product AD/Cycle development at desktop devices:

- Bachman will provide a series of knowledge-based tools to the the Bachman-Re-Engineering product set, to help with DB2 database design.

- Index Technology will offer the Excelerator series for system planning, analysis and design for customizing an organization's development environment.

- Knowledgeware, Inc. will provide the Information Engineering Workbench, a set of tools for automating the planning, analysis and design for high-level languages and IBM's Cross-System Product, the company's generic application generator and fourth-generation language.

Among them, IBM also introduced Data Extract/DI, which allows users to extract data from Digital Equipment Corp. VMS systems for moving to IBM systems.

Further, the company has added implementation support for AD/Cycle with the assistance of four software providers: CAP Gemini America, Computer

Power Group, Computer Task Group and GE Consulting.

"What IBM announced is only the beginning," said George DiNardo, executive vice-president of information management and research at Mellon Bank NA

that until the repository arrives, his vision of having a core of programmers at a central site with other programmers in business units hinges on the repository.

In addition to concerns over the repository, observers said it

Data Definitions, Inc., a New York consultancy specializing in DB2, and the three companies have different views about what a business model looks like, although it is assumed it will be based on Knowledgeware's model.

Shaka Atre, a partner with Coopers & Lybrand's Atre Computer Assistance division in Rye, N.Y., added that IBM's announcement assumes that everybody has started from scratch. "IBM has not stated how it will transfer all the information that is in existing dictionaries," she said.

Werbin added that "it will take at least three years before the repository is fully fitting things together." Beyond that, he said, "It will be at least five years before applications can actually interconnect."

Charles Dietz, manager of data administration for pensions, savings and retail at Metropolitan Life Insurance Co. in New York, said that the only thing that has changed is that he now has a delivery date. "I still don't have information on what the data model will be."

George Conrades describes the AD/Cycle strategy

In Pittsburgh, "Toward that end, I am happy that they haven't destroyed the repository again. But I want to begin to play with it and see what it does."

DiNardo said he is excited about tools for restructuring and specification coding but added

it is still unclear how three incompatible CASE systems will work together. When the repository becomes available, products for Knowledgeware, Bachman and Index Technologies will still have their own dictionaries. Aaron Werbin, president of



Werbin, vice-president and general manager of programming systems

will not address the entire application life cycle. "While IBM has addressed business modeling," he said, "they have yet to address requirements, design and implementation in the repository."

Although IBM was not specific about when it will address the entire life cycle, Werbin said he looks forward to linking the whole life cycle to a central repository.

According to IBM, Repository Manager/VM Version 1, Release 1 will become available next June and include a common programming interface to MVS/ESA and MVS/XA as well

as the Information Engineering Workbench, a set of tools for automating the planning, analysis and design for high-level languages and IBM's Cross-System Product, the company's generic application generator and fourth-generation language.

Among them, IBM also introduced Data Extract/DI, which allows users to extract data from Digital Equipment Corp. VMS systems for moving to IBM systems.

Further, the company has added implementation support for AD/Cycle with the assistance of four software providers: CAP Gemini America, Computer

Lotus invests in Sybase to fuel midrange move

BY PATRICIA KEEFE
CW STAFF

CAMBRIDGE, Mass.—last week unveiled a new alliance with Sybase, Inc. that netted the spreadsheet leader a 15% minority ownership in the database engine supplier.

The deal is expected to bolster both companies' presence in the midrange area while strengthening a Lotus bid to extend its core business into the heart of corporate America—the spreadsheet market.

"Today's front-end software for Lotus is thought of as being spreadsheets. We want to broaden that focus," said David Gilmore, Lotus vice-president of database systems.

A similar alliance between Lotus and Oracle Corp. has long been rumored. However, one industry source said that when the

two were not able to strike a deal, Lotus turned to Sybase. "The technology is first-rate and fits better than would any other partner," Gilmore said.

Moreover, "it gives Lotus possibly the largest single ownership position in a company that holds the keys to Microsoft's SQL Server and Ashton-Tate's high-end database future," said Richard Shaffer, publisher of the newsletter "Computer Letter."

The investment is key to efforts to provide Lotus spreadsheet users with access to diverse sources of data, Lotus executives said. It is also Sybase's first venture with a front-end tool supplier. Lotus joins Apple Computer, Inc., Next, Inc. and Ashton-Tate Corp. as investors in Sybase. Apple reportedly owns less than 8%, and Ashton-Tate's share is said to be less than 5%.

An option to buy up to another 10% in the company over the next 10 years, would make Lotus the largest shareholder in Sybase, said by Shaffer to be one of the fastest growing database companies today.

Detailed on product plans were fuzzy. The alliance encompasses joint development, marketing and distribution provisions for future products. The two partners will work together to ensure that Lotus applications exploit the capabilities of Sybase's SQL Server technology, starting with 1-2-3 Release 3.0. The lat-

ter was demonstrated at NetworkWorld earlier this month running under SQL Server. No ship date has been disclosed.

Lotus and Sybase remained mum on the financial aspects other than to say that it will not negatively affect Lotus' bottom line. The agreement also put Frank King, senior vice-president of Lotus' software products group, on the Sybase board of directors.

The Lotus investment in Sybase adds even more weight to the considerable industry support already built up behind the Microsoft/Ashton-Tate/Sybase SQL Server technology.

Concurrently, this wellspring of support is expected to go a long way toward solidifying the comfort factor for network managers in moving to Sybase between the \$50 million Sybase and its rival, the \$500 million Oracle, said Richard Fleiskenstein, a database consultant and partner in Performance Computing, Inc. "It sends a strong message, and it's clearly something that Oracle will have to deal with," said Adrian King, general manager of Microsoft's Work Group business unit.

From a desktop perspective, the alliance is seen as further strengthening Microsoft Corp.'s SQL Server strategy and, subsequently, its drive to establish OS/2. Many industry observers believe that Microsoft sees SQL Server as "the great white hope" for OS/2. "We think it's a great idea," King said. "Like the old saying, they like it so much that they bought the company. It's a great endorsement for SQL Server."

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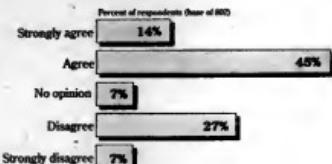
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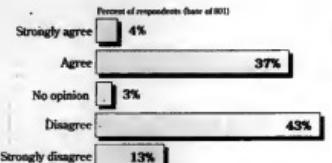
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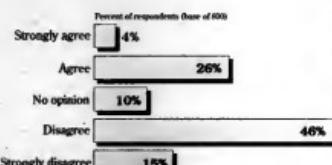
Most IS professionals say information systems is regarded as a critical part of their organizations but that it's insufficiently staffed and ill-funded



"Management views IS as important to the strategic position of the company."



"My IS department is adequately staffed."



"We always have enough money budgeted to do the job well."

SOURCE: COMPUTERWORLD SURVEY

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NEXT WEEK

Bill Crowell of ► McGraw-Hill's F.W. Dodge Division believes that IS should be an active partner in the initiation and development of business endeavors. This isn't just a theory; it is something Crowell has tried to do from within an information systems division and as a non-IS executive in a business unit. Read about it in Executive Report.



ANDREW RAY

IBM's new chief of science and technology says that although that company has slipped from first to eighth in world patents, aggressive ongoing research and development guarantees that "you ain't seen nothing yet." John Armstrong elaborates on the firm's technology directions and plans in an interview that will appear in Depth.

INSIDE LINES

Feds finally worried

NASA is vexed about reports that the Columbus Day (also called the Datormine) and Friday the 13th viruses are primed to strike PCs on Oct. 12 and 13. The shuttle *Athenae*, which is carrying the Galileo satellite on a mission to Jupiter, is slated to lift off Oct. 12. There is "more than a modicum of concern" at NASA that a virus outbreak could interfere with the launch, according to Wim Schwartz, president of America Computer Security Industries (ACSI) in Nashville. Schwartz said that NASA and several other government agencies in recent weeks have purchased some 20,000 copies of ACSI's Vexter software, designed to rid infected PCs of Datormine and other viruses. Officials at Johnson Space Center in Houston, however, did not return calls seeking comment.

IBM finally serious?

IBM will hold a "major" Micro Channel Architecture (MCA) announcement tomorrow in New York, hosted by Robert Carrberry, the MCA man is the know. The briefing is expected to detail advanced MCA capabilities promised when IBM first announced MCA. Related products should follow shortly.

Riding into the Sun-set

While Sun continues to gain Sparc licensees, there are persistent rumors that AT&T has second thoughts about building Sparc-based systems. Development of such systems is said to have been on hold for months while AT&T engineers evaluated Motorola 88000 and Intel 80386 chips. Although many have expressed interest in the RISC architecture, only Sun and SunSource have shipped Sparc-based systems.

An impartial judge

DEC has officially responded to Adaptec's requests to reverse its bundling of runtime RDB with the VMS operating system, according to a DEC spokeswoman. In a letter sent to Adaptec, DEC "refused the concerns" of the vendor council, stating that there was no evidence given to suggest that the packaging of RDB is unfair practice. Adaptec will discuss whether to pursue the matter at a meeting next week.

Praise from the enemy?

When asked about the future role of the mainframe at last week's *Business Week* symposium of IS executives, AT&T Computer Systems President Gordon J. Bridge sounded a conciliatory note toward the competition. "I actually think IBM's Officevision is a good articulation of that, with the mainframe as the repository of data," he said. Bridge joined AT&T last year after a 19-year career at a well-known vendor based in Armonk, N.Y.

Benchmark Wars III

We lived through Benchmark Wars I (the mainframes) and Benchmark Wars II (the microcomputers). But can we stomach yet another battle? The vendors don't care, because Benchmark Wars III (the servers) is out of production and coming to a press release near you. Not on the heels of a benchmark for Microsoft and Ashton-Tate's SQL Server is Gupta Technologies with an SQL benchmark that reportedly goes further.

Technology marches on

The latest government procurement: a Morale Welfare and Recreation Market Analysis and Program Planning System. The Orkland Corp. in Silver Springs, Md., signed a one-year contract with four option years to develop a system for Army use in management of "quality of life" operations such as officer's club, golf and bowling. In light of Congressional budget-cutting action, according to a press release, MWR programs are under pressure to improve return on investment.

The Great Koko has been torn down, at least in media descriptions. A man-on-the-street column in The Santa Cruz Sentinel featured Philippe responding to a query about recent rains out West. But the chief of Berlendis was described merely as "Entrepreneur, Scotts Valley." Not a very hefty title for the man who would be spreadsheet king. One of our readers just might you should train. If you hear something just like lightning, call News Editor Paul Berlinski at 800-343-5474 or 508-579-0700.

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The way most computers are used is an insult to their intelligence.

Your brilliant computer may be dumber than you think.

The sad fact is, while thousands of businesses have hooked up personal computers to mainframes, the majority of those computers are used as "dumb terminals," leaving a vast potential untapped.

For MSA, the intelligent workstation is a promise that should be kept, which is why we are proud to introduce BrightView™ applications software.

By harnessing the power of cooperative processing, BrightView enables the intelligent workstation to perform tasks previously restricted to the mainframe. This revolutionizes the efficiency of your entire computer system, meaning each component can now do what it does best, with valuable mainframe resources freed up for more appropriate tasks.

What's more, MSA is the first company committed to delivering the most extensive line of SAA-compliant software in the industry, and BrightView is already in compliance with SAA's most advanced component, Common User Access. It yields a friendly, consistent look and feel to workstations, helping maximize your investment in both personnel and hardware.

Whatever your software applications needs are, it might be wise to call Robert Carpenter at 404-239-2000. In fact, it's really the only intelligent thing to do.



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